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A primer on school design prepared to serve as a review of educational change and architectural consequences. Major themes underlying reforms in education are discussed, teaching and alternative learning arrangements are reviewed, and the interrelation of school activities are examined. The current educational scene is reviewed in an attempt to discover those innovations which have implications for facilities. Alternative teaching-learning arrangements needed to meet various educational objectives are portrayed. Also suggested are some various combinations of people, spaces and resources to indicate how certain activities might take place in relation to one another. Many photographs, diagrams and drawings illustrate this document. This document previously announced as ED 026828. (FPO)

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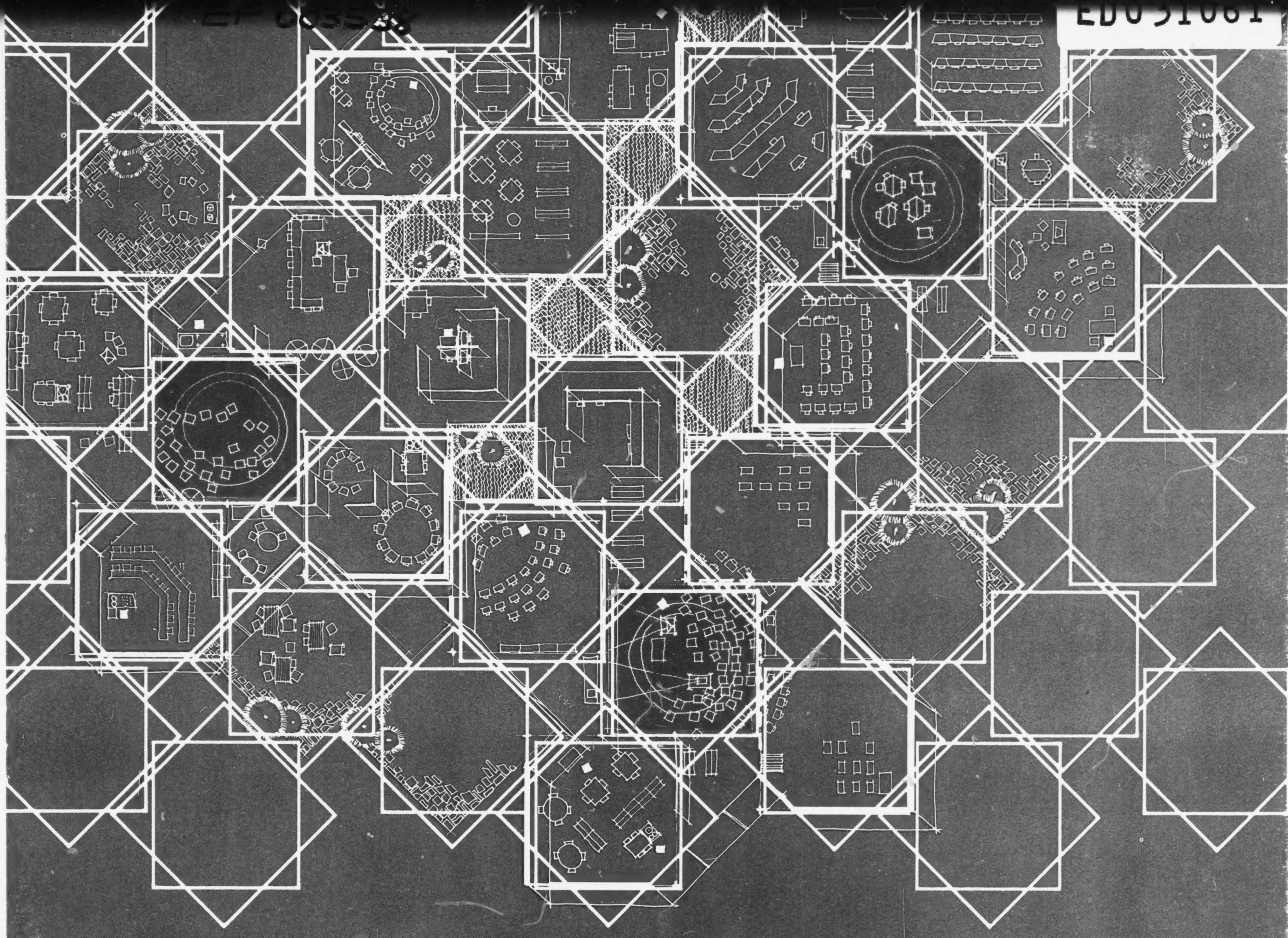

A REPORT FROM EDUCATIONAL FACILITIES LABORATORIES

Educational Change and Architectural Consequences

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Educational Change and Architectural Consequences

A Report on Facilities for Individualized Instruction

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Foreword

This report is a primer on school design. It was prepared by EFL to serve as a review of educational change and architectural consequences. Many of the significant decisions regarding school planning in the United States and Canada are made by the laymen who constitute the school boards and building committees in communities across the continent. This report has been prepared to aid these laymen in creatively exercising their responsibilities.

American education is changing in many ways—some of them quite fundamental. The design of school buildings, furnishings, and equipment can facilitate—or retard—these changes.

Chapter I—The Spirit of Change—reviews the current educational scene, trying to discern major themes underlying the various reforms that are stirring in education today and that have implications for facilities.

Chapter II—The Instructional Encounter—comes down to cases and shows some of the ways in which forward-looking schools bring together children, teachers, and resources—at different levels, in different subjects, for varying purposes. This section suggests the teaching and learning arrangements needed to meet various educational objectives in an effective school program. Rather than setting forth imperatives, it portrays alternatives, ranging from the very simple to the highly sophisticated.

Chapter III—The Schoolhouse—suggests some possible combinations of people, spaces, and resources. These syntheses indicate how the kinds of activities now widely considered to be desirable in a sound school program might take place in relation to one another.

We acknowledge at the start that learning, the spirit of education, cannot be directly produced through design. Design can create a felicitous environment, a sound body for the spirit of learning. The aspects of schooling with the most obvious implications for facilities are the logistical elements, the parts you can kick with your foot or photograph or time with a stopwatch: places, people, resources, and time.

The intent of this book might best be expressed as an effort to give those concerned in planning schools the widest choice of options in designing new facilities or redesigning old ones. The patterns suggested here are essentially simple, open, and flexible. Rather than dictating any particular instructional pattern or technological system, they are highly responsive to the educational desires of the particular people who will use them. They can accommodate the conventional self-contained classroom program if that is called for—but they do not lock the user into that pattern, if a different approach commends itself now or later on.

In short, these designs give freedom to teachers, administrators, and students. To the student, freedom means increased responsibility for his own education. To administrator and teacher it brings heavier responsibility for deciding the priority of educational goals and the best means to use in their pursuit. This book is directed to the design of schools for those who seek more educational and architectural freedom and welcome the ensuing responsibility and to the communities which support and encourage them.

EDUCATIONAL FACILITIES LABORATORIES

The Spirit of Change

A new spirit enlivens American education today—a spirit of innovation, experimentation, venturesomeness. On the one hand, school people—teachers, administrators, and board members—face staggering problems which stubbornly resist the old solutions. The school population explosion, the growth of knowledge in every field, the belated cognizance of the educational handicaps of underprivileged children, the heightened skill requirements of the labor market in the face of automation, the continuing shortage of qualified teachers and administrators—the challenges always seem to stay one jump ahead of even the most farsighted school system.

On the other hand, many enterprising educators have seized the opportunity these problems present to break the old educational molds and introduce change into the schools. They are beginning to question the old accepted notions; they are asking themselves and their staffs: "Why?" about this practice and that: "Why do it this way?" "What are we getting at—and is it a worthwhile objective?" "Is there a more efficient and effective way to achieve this educational objective?" Perhaps the most basic common feature of today's educational ferment is this questing spirit. To paraphrase Whitehead, the greatest innovation in education today is innovation itself. The so-called revolution in the schools is really a series of continuing revolutions, and there is no end in sight.

For, while critical problems keep steadily pressing on the schools, fresh ideas in school organization, communications technology, and curriculum, and new approaches to teaching and learning beckon educators toward higher ground. Team teaching, the use of teacher aides, programmed learning, instructional television, filmed courses, new curricula, nongrading, independent study, the encouragement of creativity, improved professional training, better techniques for evaluation—these and a half dozen other new or newly emphasized ideas seem worth attention and perhaps adoption.

Mathematics and science courses have been thoroughly overhauled, and the modernization of courses in other subjects is well under way. Instead of being required to sit passively while knowledge is poured into them, students are increasingly being encouraged to learn by discovery and to become actively involved in learning. "Difficult" subjects are being introduced earlier. Schools are trying to adapt education to the particular needs of each child—including the talented child and the slow learner. More attention is being given to the formative early years of a child's life, especially the "preschool" years. Team teaching and the use of nonprofessional aides for nonteaching classroom tasks are helping make more efficient use of teaching talent. The teacher is becoming more of a guide and less of a "teller." Underutilized audiovisual equipment—television,

language laboratories, overhead projectors, the new, sophisticated "A-V information retrieval systems"—are being put to imaginative use as an integral part of the school program. In sum, new opportunities as well as new problems challenge the schools to innovate.

Of course, innovation in education is still more of an enlivening spirit than a ground swell that's shaking the country. Of all the new ideas, only the curriculum reforms have made major inroads on American schools generally. All the other ideas put together have probably touched, so far, not more than 10 to 15 percent of the schools.

But in every area of educational practice today, a striking variety of options has opened up. Suddenly all "standard operating procedures" are on trial, not under the rubric of some all-encompassing philosophy, but under the pragmatic goad of new demands and the pressing need for workable alternatives.

No longer fixated on the philosophical controversy between "progressivism" and "classicism," schoolmen and the interested public are increasingly concerned with what works best in the accomplishment of specific instructional goals. John Dewey's insistence on the central importance of understanding the child and his development is no longer in dispute, despite the mistakes and misinterpretations of his followers. Educators have moved on to recognize the parallel importance of understanding and capitalizing on individual differences among *teachers.* Controversy has shifted from the philosophical underpinnings of education to the best ways of applying resources to achieve goals. The net result is that educators of every philosophical persuasion, released from doctrinaire shackles, can call upon a vastly enlarged repertoire of resources to use in putting together an instructional program.

The climate is not a comfortable one for the school board, the educator, or the architect—or, for that matter, for the student who merely wants to learn a set of study skills and then apply them with diligence.

Disconcerting as it is to operate in such a climate, it also has its advantages. The new kind of school doesn't encourage mistakes, of course: it aims for organizational patterns that will work and work supremely well. But the new climate *permits* mistakes and facilitates their correction. The responsive educator today cannot help feeling a heady opening up of his chosen field, plus a magnificent expansion of his repertoire, a multiplication in the options available to him for solving old problems and tackling new ones as they arise. The very diversity of new ideas and procedures is enough to assure that none is seized as a panacea.

Underlying this process of diversification and enrichment, a remarkable kind of fission seems to be operating on the concepts of education. Time was when concepts like "teacher," "class," "curriculum," "class period," "textbook," "classroom," and "school" each had an accepted definition. Everybody knew—or thought he knew—what a teacher did, what the "ideal" class size was, what a curriculum consisted of, and what a schoolhouse was like. And these definitions saved a lot of troublesome thinking, because in combination they served to answer a great many questions about how to "do" education. Schools, almost by rote, built a program out of these basic blocks, bringing teachers together with uniform-sized groups of children of a given age, supplying them with syllabus and textbook, chopping up the day into standardized units of time and deploying people and resources throughout the eggcrate buildings.

As in other fields, these unitary educational concepts helped people to see similarities, but prevented them from seeing differences. Now, suddenly, each of the old, standard building blocks of the educational program seems to be breaking up into parts, with the resulting release in energy that is the product of fission. To many educators, *teacher* now seems too monolithic to be the effective unit of instructional staff; they want to make finer distinctions that capitalize on particular talents, interests, and responsibilities. *Curriculum* begins to sound too collective if each student is to function as an investigator in his own right for much of the time. *Period* and *class,* as customarily defined, are too rigid as units for dividing time and space if students are to be brought together with teachers and resources not just in one basic way but in diverse ways. A given textbook is too uniform; replacing it are all kinds of materials, including paperback source books, science kits, programmed texts, audio and video tapes, films, and computerized programs.

In short, the standard components of the instructional program suddenly multiply and become diverse, flexible, variegated. Selection, design, utilization all become more complex—but also, there is reason to hope, more effective. Schools are beginning to take a new, more discriminating approach to the educational program, an approach which reduces each once-unquestioned component to its significant modules and then builds them into a program for each student.

Until recently there was no economically practical way to make instruction truly individual. All that education could do to provide for individual differences was to adjust the basic school program as best it could to the needs of each student. Today, however, innovating educators *start* with the student and with many programs. On the premise that no single program is applicable to everyone, they attempt to meet each student where he is and adapt a combination of programs to his needs. Around this central idea the various new procedures fall readily and fruitfully into place. Various sized groups, continually accessible to the student, can meet his changing needs and

powers. A team of teachers—or one teacher, or another child—can provide the particular kinds of stimulation and guidance he needs at any given point in time. A curriculum can be designed to feed his curiosity and reward his initiative. A flexible schedule based on small modules of time can make sure that no arbitrary bell will decapitate thought or action. A wide variety of resources will permit him to pursue both his formal subjects and his own interests in the way best suited to his needs.

What seems to be happening, then—to extend the atomic analogy—is that the old concepts and procedures, split up as by fission into their essential parts, are now being put back together by a kind of fusion into a more meaningful and coherent whole. The wealth of new options in designing a school program must be considered with this focus: how, in a particular situation and with the available resources, can each individual student be given a set of experiences which will best facilitate his own education. The whole way of thinking about school programming thus undergoes a transformation: rather than thinking first of uniform classes, teachers, texts, class periods, curriculum units, and grades, the innovating educator thinks first of the individual student and the wide variety of options—of modular units of time, space, personnel, and materials—at his command.

Such innovation doesn't come cheap, and when introduced piecemeal, primarily to save money, often comes a cropper. On the other hand, the new ways of education are not necessarily expensive ways. Building a program for each student, for instance, doesn't mean a vast increase in staff or space, but rather a reallocation of staff and space. Initiated throughout a school system, such a program could make economical use of the educational fact that the smallest children need the smallest instructional groups—10 children to 1 teacher, say—whereas by the time they reach high school, students do fine in a 50:1 ratio for some purposes, combined with increased independent study and tutorial work. As Part II will demonstrate, the difficult trick to realizing an individual program for each child is keeping it individual *within* groups of various size. The idea isn't one teacher: one child. It is *one child: one program.* And, in the new educational enlightenment, an elementary school with 600 students and 20 teachers is not therefore a school with a 30:1 student ratio: instead it makes the best use of *all* its teaching talent for all the children it has to teach.

How does the educator decide among the diverse options, procedures, patterns, and resources? His choice depends on many things, including some highly important factors—like economics and politics and social climate—outside the purview of this report. A school system's particular problems will determine priority among solutions. But whatever the problems, there can be no single, simple answer. Rather than a choice between panaceas, the practicing educator is faced with the need to orchestrate a variety of approaches and practices to meet his particular needs.

The shape and atmosphere of the schoolhouse is changing drastically under such an approach. The new words which educators use to express their needs for space are words like "open," "simple," "flexible," "ample," and even, it is gratifying to report, "beautiful" and "exciting." Of all of these, perhaps "flexible" is the most used and the most abused, but also the most promising. For of all the vices of traditional school design, the one which most acutely galls the experimental, innovative educator today is the constraining effect on the educational program itself. "A schoolhouse is a big box filled with equal-sized little boxes called classrooms," wrote one educator in a passage which has become the touchstone of reform in school design. "The very architecture sorts the children. It helps the administration to establish groups of uniform size—25 pupils if the community is rich, 35 if it is poor, and 50 if it doesn't care. In each box is placed a teacher who will be all things to all children all day all year. If it be a secondary school, bells will ring to signal the musical chair game that is played a half dozen times a day as groups exchange boxes."

The rallying cry against such rigidity has been "flexibility." Of course, the term has become a catchword, and architects complain that too often it allows educators to shift educational problems to them, without indicating the solutions. There is some truth to this criticism: flexibility is a high abstraction and only gets its meaning when broken down into specific requirements to fit particular cases. Thus architect William Caudill has abandoned the word in favor of more specific terms: *expansible space,* that can allow for ordered growth; *convertible space,* that can be economically adapted to program changes; *versatile space,* that serves many functions; and *malleable space,* that can be changed "at once and at will."

But despite its frequent overuse and misuse, flexibility should not be exorcised from educational discourse until more than the present minority of schools reflect the basic truth it expresses. For it is true that our schools have exercised a Procrustean constraint on educational imagination and innovation. Now, with education in an unprecedented phase of questioning, changing, and experimenting, Proteus may at last replace Procrustes.

To put new teaching and learning procedures into actual effect in a particular school always comes down to logistics. An educational innovation must not only be conceived, understood, and adapted at the policy level—it must be *designed* to work in a specific situation. And here is where many a school administrator has felt thwarted because "the building wouldn't get out of the way."

Educators have pointed out how innovative approaches as disparate as nongradedness and televised instruction are handicapped by facilities that block groups of students and teachers off from one another, make mobility onerous, impose a tight-ship kind of discipline and a custodial attitude toward resources, and prohibit full use of technology. "The greatest single factor limiting the effectiveness of a team approach," complained one typical high school faculty, "was found to be the lack of adequate physical facilities." Rigidity, isolation, sterility, formality, inaccessibility, uncommodiousness, starkness, immobility, permanence, constraint—these are the words which veteran schoolmen use to characterize most existing schools. And these are exactly the qualities which innovating educators want to avoid in schools designed to accommodate new programs. The school program should dictate school space and not the other way around. "Building design makes a major contribution to a school program aimed at quality education by providing greater flexibility," to quote the final report of the National Association of Secondary–School Principals' Trump Commission.

In some cases, like televised instruction or the new emphasis on independent study, the implications for design are strong and clear. In others, like the new curricula or programs that foster creativity, they are less so. But taken as a whole, innovating ideas and procedures, by their very diversity, suggest that educators will increasingly want the freedom and the capacity to bring teachers, students, and resources-technology together in diverse and flexible ways.

In a time of rapid change in education, the responsible school superintendent will want to plan new schools with a built-in second guess. The superintendent-after-next may have different ideas, or conditions in the community may have changed. The school building planned today will perforce serve new functions well into the next century and even new goals during its lifetime: it should be designed to serve them as well as possible.

Old walls should not stifle new ideas. Identical boxes must not enforce the same program on all students and teachers; each is a unique individual. Fixed furnishings must not quash spontaneous inquiry. Dismal, spiritless, and uniform decors must not blight a child's creativity. Perhaps the designing of schoolhouses may rise beyond conforming to a fixed pattern of school organization and learning. Perhaps educators and architects can create an ever changing, constantly improvable environment for the learning process—what John Goodlad calls "a self-renewing school."

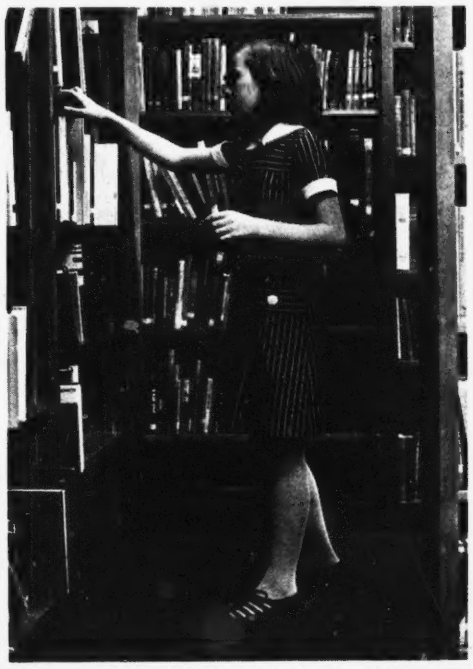
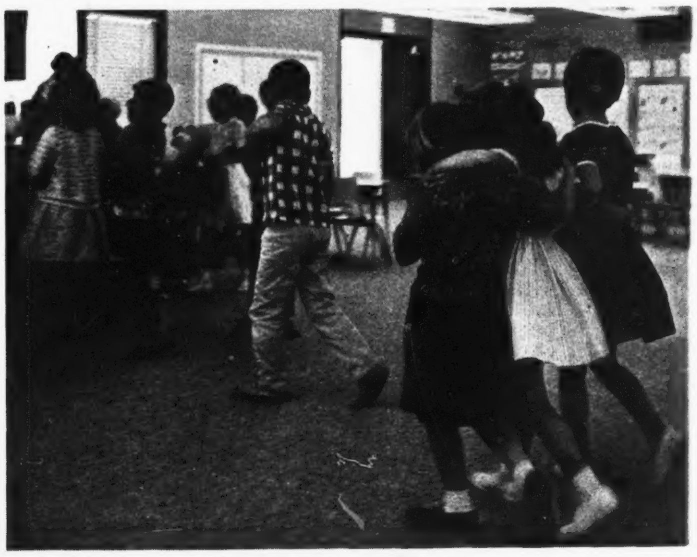
II The Instructional Encounter

Introduction

Progressive schoolmen today are asking what can be done to improve learning, given the school's total instructional staff, its repertory of learning resources, the talents of the students, and the time and space available for the school program. Only when considered in such generous and strategic terms, they feel, do logistical problems yield to the most efficient and effective solutions. They are therefore asking questions like the following:

As the individual student moves through a formal education program, what different kinds of opportunities should he have for learning different things in different ways? When and how often should he work by himself, with a peer or two, with a dozen students and a teacher, in larger groups? What resources and technology—such as books, tapes, films, and programmed texts—should be available? What should be his contacts with school staff—with homeroom teachers, guidance counselors, technicians, demonstrators, lecturers, group discussion leaders, librarians, television teachers, community experts? What is the optimum mix—according to the best current theory and practice—of various modes of instruction or learning: presentation of new materials, for instance, or stimulation to independent work, or investigation, or drill, or discussion with a few other students?

Obviously, the mix will change in fundamental ways as the student matures. It will change in emphasis and sequence for a given student during a given school year, semester, week, or even

from day to day; the mix will also vary according to the area of knowledge or skill in question. The different elements must be considered as an integral *system,* however, in order to obtain the unique advantages of each element. For example, it is only through periodic large-group instruction employing mass-media technology that a school can save enough teacher time to set up small groups and individual tutorial sessions. Educators have begun thinking in larger terms than "teacher load," "class size," and "contact hours." They are tackling their logistical problems at a higher level than that of the individual classroom and teacher. Smaller classes, *per se,* have for too long been the popular panacea for education's ills.

In this section, we will sketch the five kinds of activity which educators have come to feel should take place for maximum learning, show how schools could organize teaching and learning around these five arrangements, and indicate how the balance might shift as the student proceeds through preschool and primary, the intermediate years (roughly grades 4-8), and high school. Also suggested are ways to bring into play the newer media and techniques that are rapidly becoming an integral part of the learning process.

Since most schools today are still designed in rows of standard classrooms along double-loaded corridors, we start arbitrarily with the conventional class grouping, since that is where most schools and most children still start.

1. THE CONVENTIONAL CLASS

Say "school" to almost anyone, and you conjure up the mental picture of a rectangular room that encloses a teacher facing approximately 30 pupils. It is hard to think of many significant occasions when people group themselves in this way outside of education. In business or the professions, people work alone; or they talk things over with somebody else; or they confer in groups of three or four up to a dozen or so; or they join large audiences—numbering hundreds, some times more—for exposition or demonstration. Yet the prevailing pattern in schools is the conventional class, with a fixed number of students and the solitary teacher who rules her roost with a minimum of either support or interference from outside. By and large, the compelling reasons behind this pattern have more to do with accounting and administrative procedures than with learning.

The conventional class does have its educational uses. In nursery and kindergarten classes, a single manageable group seems natural for storytelling, group games, reading readiness exercises, and films, and for such pedagogic functions as teaching safety habits or giving general directions. Moreover, the group as such serves valuable psychological purposes for the young child just entering school, helping him to get used to a greater variety of people than he knew at home and keeping his environment stable as he moves into the new world of school and teachers.

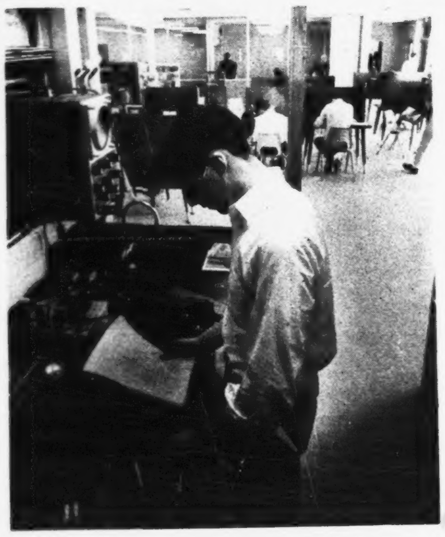
Later on, in the primary grades, a teacher usually finds she can teach a class of this size in various subjects, but for relatively short periods. Seven- and eight-year-olds get bored or distracted

pretty soon. They can take 20, or at most 30, minutes of exposition in subjects like mathematics, social studies, and science.

As the child proceeds through school, this conventional-sized class serves an important function for teacher-directed, expository teaching. The teacher introduces materials, gives directions, queries individual students, administers tests, uses films or television, presents visiting experts, or has pupils read papers or report the results of individual or small-group projects. The 30 children generally focus on the teacher (or, infrequently, on one student) with the flow of ideas going one way from the rostrum or occasionally back and forth between the teacher and a given student. But 30 children are too many for lively general discussion.

If the 1 to 30 group is too large for instruction to be effectively personal, it is an equally awkward size—too small or too large—to make efficient use of most instructional technology. On the one hand, tools appropriate for constructing models or doing scientific experiments are best used in smaller groups. And devices that can be used to good purpose for instruction, such as TV and films, are equally effective and far more efficient when used with much larger groups.

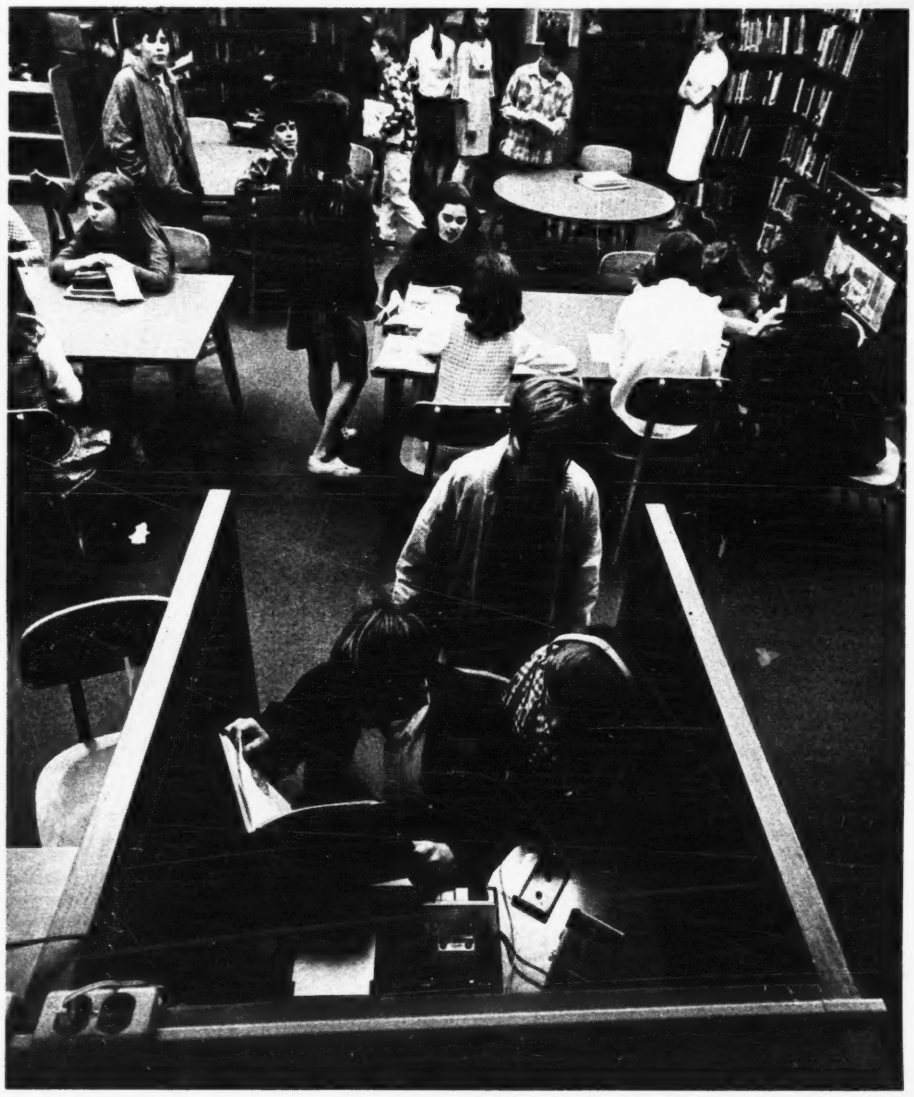
In sum, there appear to be few convincing arguments for the conventional class, with its fixed 1:25 or 1:30 ratio. In the lower grades the arrangement isolates the teacher with the same children day after day and presumes her competence in the full range of subjects taught, except for a few of the nonacademic specialties. In the upper grades, where the curriculum becomes departmentalized, the self-contained class similarly presumes the teacher's competence in the

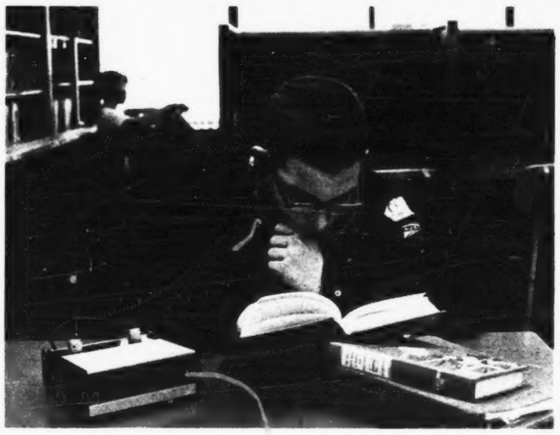


full range of his assigned subject and fails to take advantage of the variety of teaching talent and background a school may have within a field such as English or history.

Another drawback to the eggcrate school is its characteristic lack of visual variety: identical structural elements—ceiling height, lighting, windows—are duplicated in room after room. Attempts to vary the effect by wall colors or minor embellishments do little to reduce the over-all monotony or to offset institutional boredom with a lively change of scene. Those who design schools have yet to fully realize that a school should be, as Lloyd Allen Cook put it in a recent NEA paper, "an organization of unlike parts, a coordination of differences which should be safeguarded, yes encouraged, within the over-all framework."

Generally speaking, the older and more independent the children, the less use there is for the class-size group, whether the students are pursuing laboratory experiments or art or regular academic studies. While the self-contained classroom might well be used for about half the child's time in the primary grades, in the high school the standard class might better be used for a considerably lesser proportion of the school day. Under a team teaching system where greater freedom was possible, teachers would probably find that they wanted to constitute groups this size for only a fifth of the time in the primary grades, and progressively smaller fractions through the intermediate years and high school. Particularly if more teaching staff were available at primary and preprimary levels, students' independence could be fostered earlier, with a resultant lessening of the need for this standard-sized class during the rest of the school career.



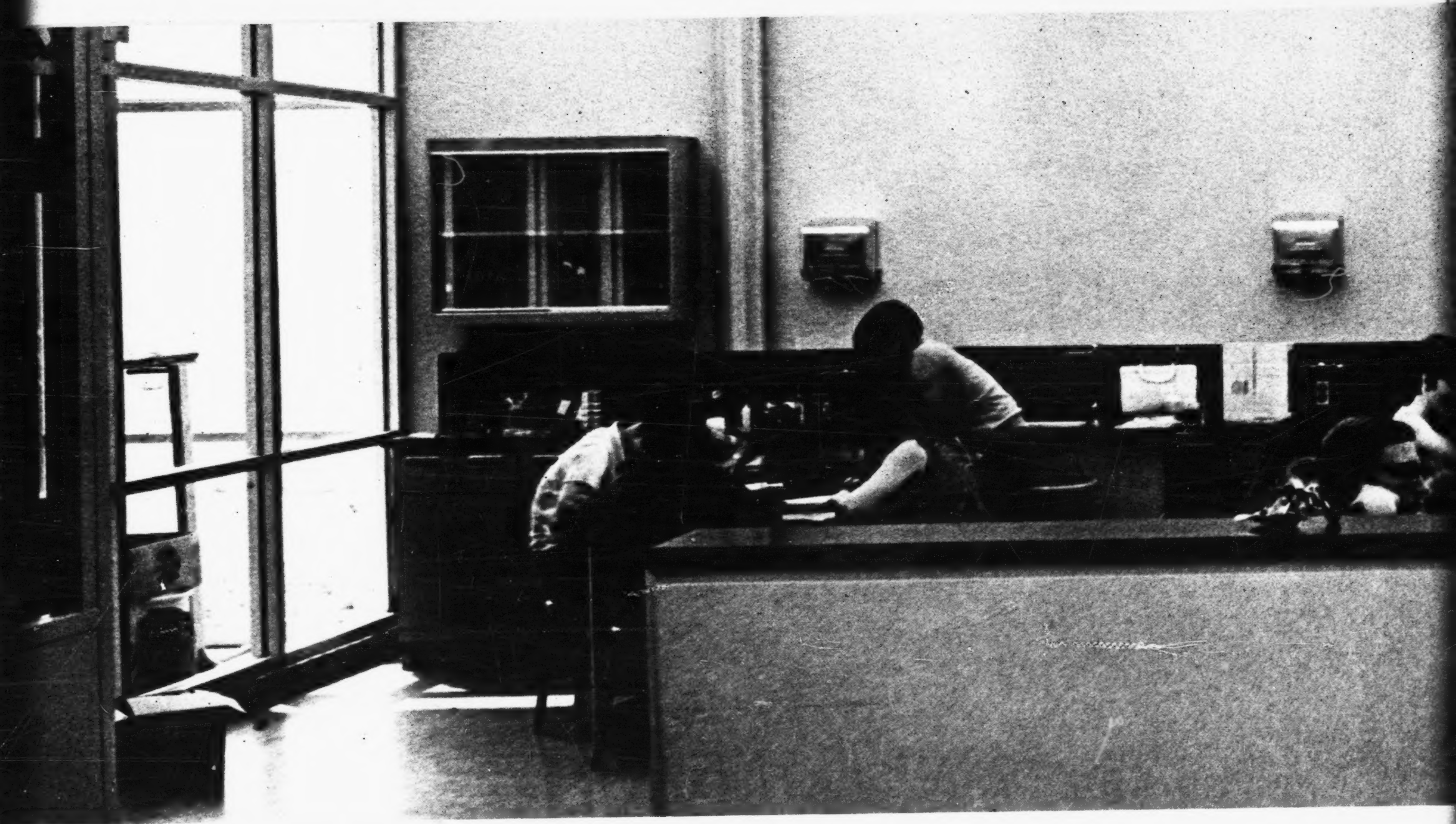


2. INDEPENDENT STUDY

If formal education is to be the launching pad for a lifetime of learning, then a teacher's highest achievement will be to make his students independent of him. Why, then, shouldn't the student begin learning to learn at once, with schools and teachers harnessing the child's natural curiosity and imagination and zest for mastery right from the start?

Independent study permits the student to develop, with occasional delight and sometimes frustration, his own power to seek out information, organize facts, master material, and generally accept responsibility for his own learning. The enterprise should not, except for rare cases in the high school, be given the name *research.* Research is a complex enterprise involving maturity and skills which most students do not develop until their mid-teens or older. A better name for a schoolchild's independent pursuits is *investigation:* delving, checking, substantiating, pursuing interests where they lead, nailing down certain skills and facts. It is the mental equivalent of physical exercise. No one can do it for the student. He must do it himself.

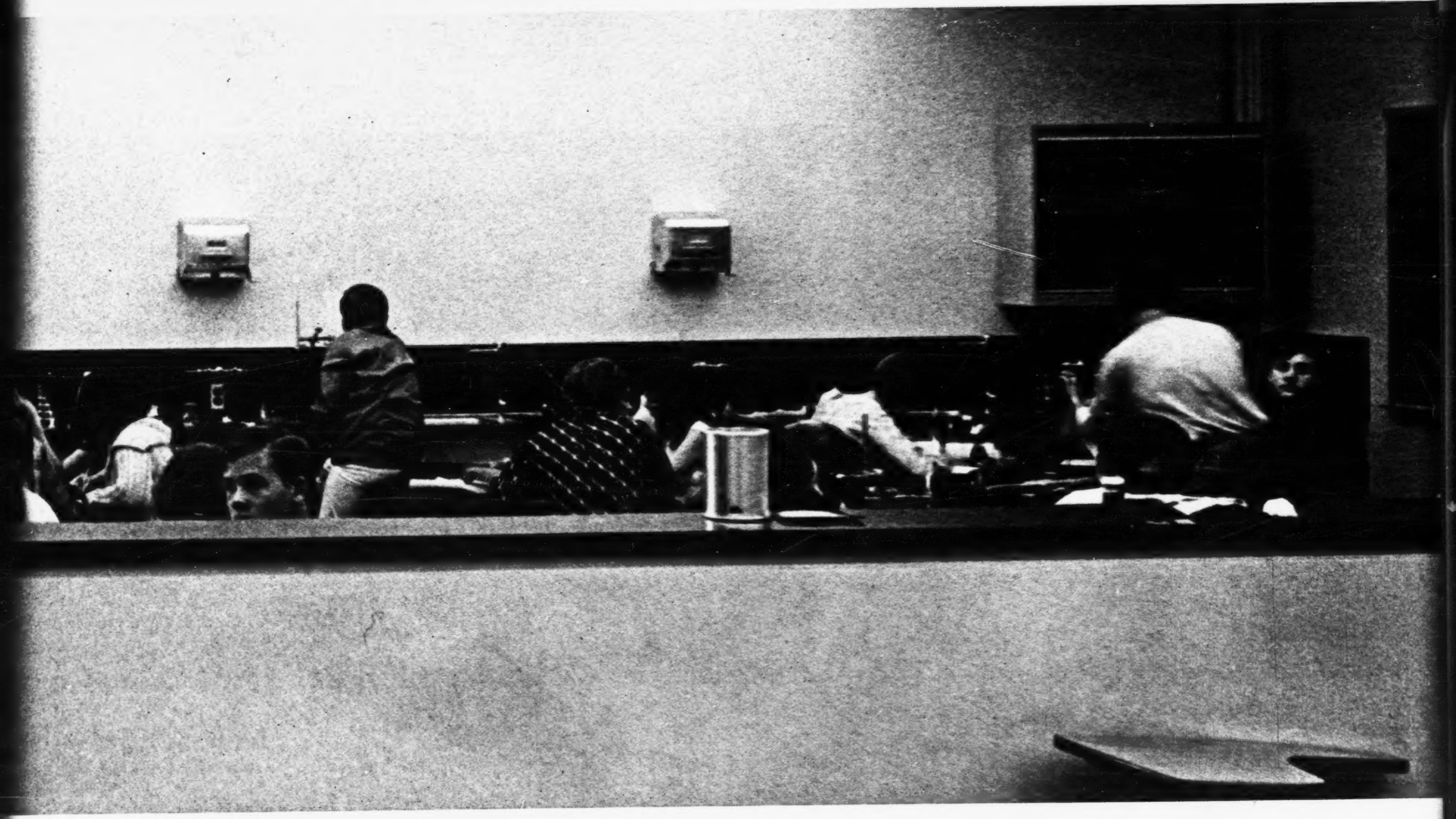
Where might such study take place? Not, certainly, where distractions are liable to occur, or where the environment dwarfs the individual—in vast study halls, 1,000-seat auditoriums, or empty cafeterias. As an ideal, one would seek intimate spaces—individual niches or alcoves, preferably carpeted, low-ceilinged, tucked away out of the hubbub of the school. But the student can obviously work at his own desk, in a carrel, or at a table in the schoolyard, under an oak tree, in the corner of a classroom or library, at a lab table or shop bench—anywhere that the school



allows the child to find a house of his own. The student's carrel may be in a library, learning center, study hall, classroom, or ideally in many such places. The learning center might have chairs arranged to permit students to read and work with a minimum of distraction. There could be appropriate spaces for work-study projects as well as more specialized spaces like writing or reading laboratories. Programmed-learning machines or books could be used in a part of the library partitioned off to provide a more intimate setting. Even the self-contained classroom can provide a variety of opportunities for children to pursue individual tasks in a book corner or at an easel or workbench.

Independent study begins in the home, where the child through practice learns to do such things by himself as dressing, tying his shoes, using the toilet, playing, looking at books, counting, and learning a great variety of things by direct experience.

In the pre-primary school, this process can be strengthened by an even richer environment. Montessorians and behavioral scientists like O. K. Moore have demonstrated that very young children derive tremendous satisfaction from self-correcting devices from which they can learn at their own pace without the intervention of an adult. Specifically, nursery and kindergarten children should have the opportunity for free exploration of materials, paints, books, and blocks, as well as slides, and short films. Not to be neglected, too, are the educative effects of diverse textures, colors, and materials which should splendidly abound in the nursery school classroom. The richest possible direct experience with the physical world has, according to recent psychological research, a good

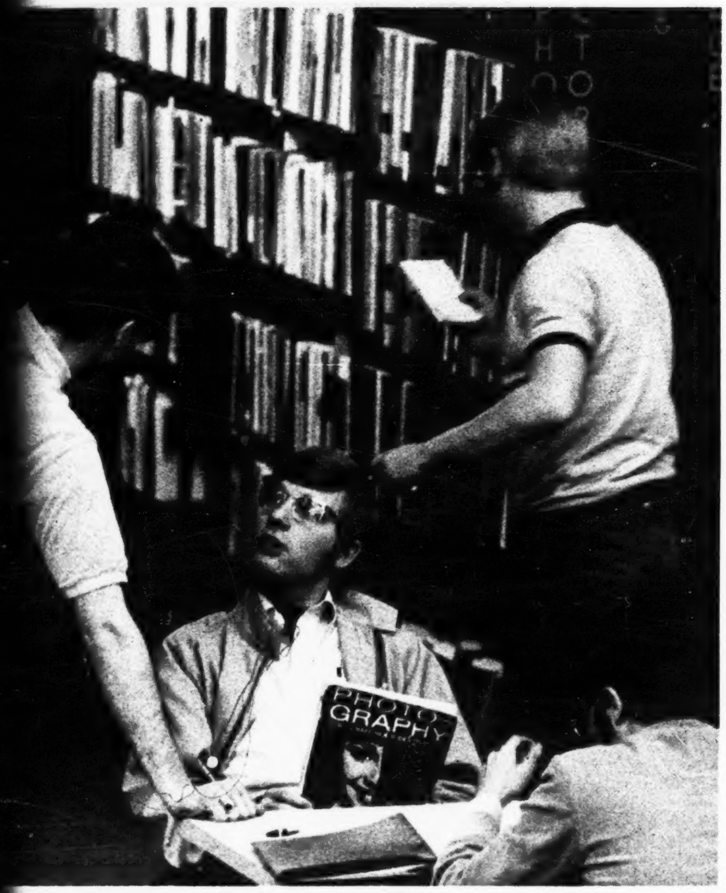


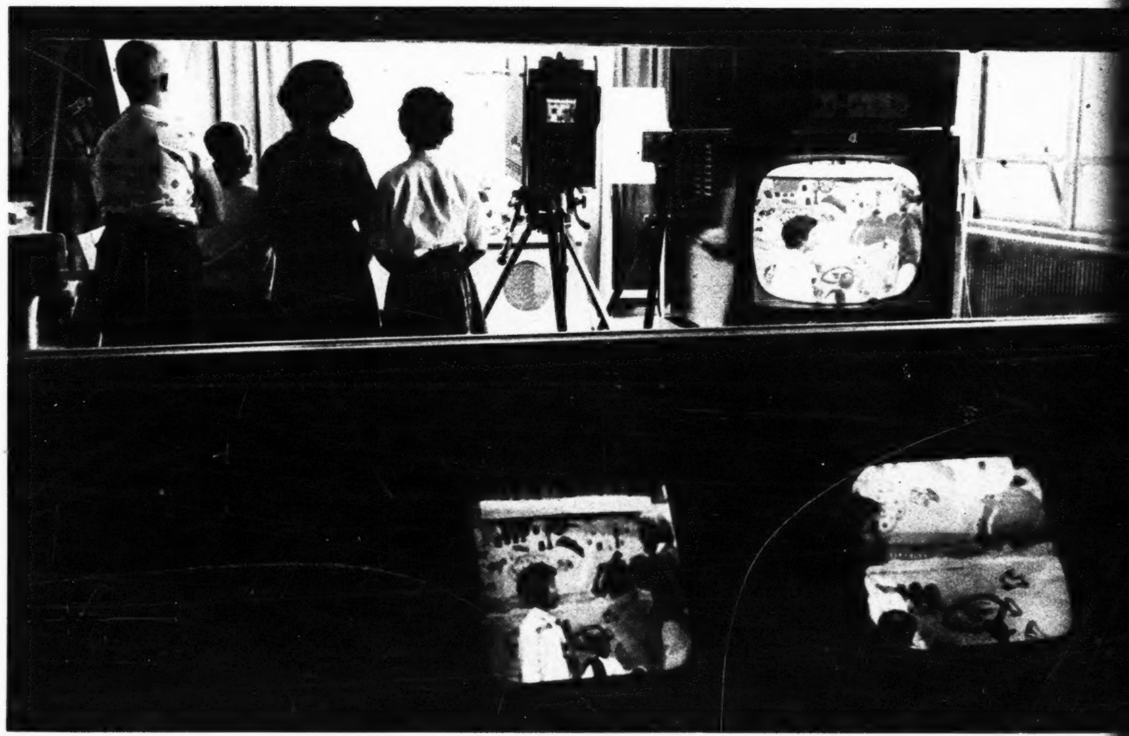
deal to do with the vigor and sharpness of the young child's intellect.

The same process can continue through the primary school, with the child independently investigating the library corner of his classroom, perhaps deciding to play alone at recess or to work alone in a setting arranged to enhance his particular project. Learning to read looms large during these early years, and a child can acquire this basic skill faster by using devices such as sandpaper letters, typewriters, films, tapes on reading readiness, and magnetic recording cards.

As the child moves ahead, he begins to use his newly acquired skills for independent pursuits. He acquires increased self-reliance in the library-learning center, and can pursue his personal interests there. Through the use of programmed materials he can proceed at his own pace in mastering some materials, and can even test his own progress and determine how much drill, remedial work, or other extra work he needs. A wealth of multi-sensory equipment can come into play here: single-concept films on cartridges, microfilmed materials, audio- and videotapes, maps and globes, books and other printed materials, slide projectors and individual filmstrip viewers. A systems approach to such resources, through the audiovisual information retrieval system, would make the impact of each even more powerful.

By the junior high or middle school years, a student needs more specialized materials and equipment for independent study. Laboratory tables for math and science experimentation, simple computers, art materials and facilities, industrial arts machines—schools can deploy them for students to use, safely and profitably, without continual supervision by an adult.

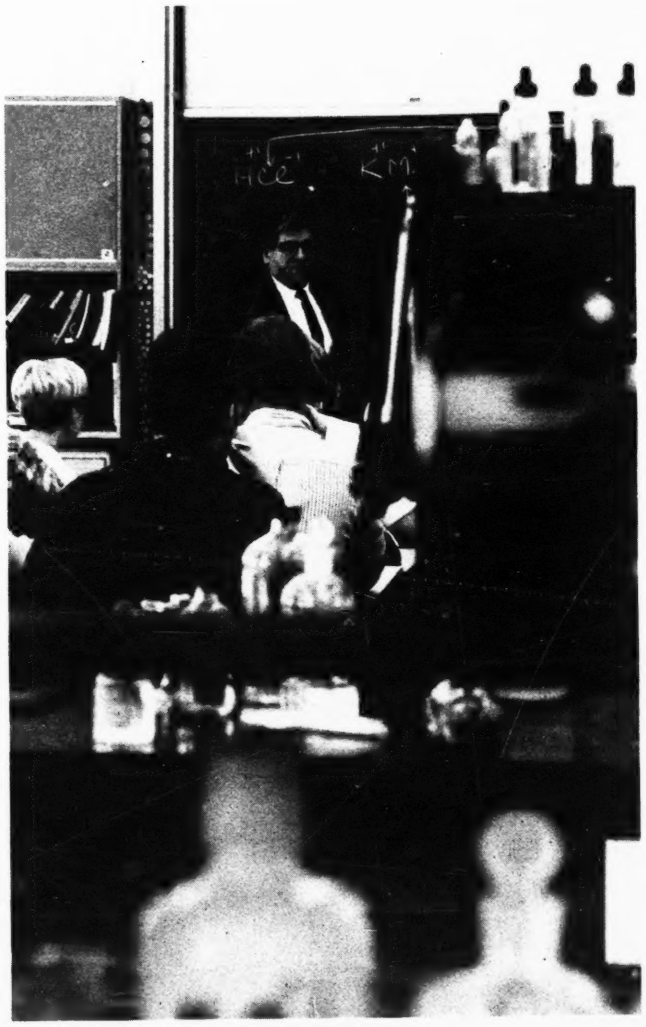




The center of independent study for nearly all students by now should be the comprehensive library-learning center. In fact, his carrel or station in the center can serve as the hub of each student's school program during these years. Individually scheduled work on the common curriculum, as well as on individual projects, should be a central part of the student's education. Electronic aids and programmed materials become critically important; and experts are equally essential to make these powerful tools work.

The high school student ideally becomes even more responsible for his own learning. Guidance is essential, of course, but with self-reliance the norm. Independent study may begin to approximate genuine research in this period, as more able students pursue original work in science, the humanities, or artistic creation. Some students will have identified their major field or fields of interest, and will naturally and fruitfully push as far and as fast as they can into these areas. Since students may be highly motivated at this stage, they often pursue courses of solid reading and make considerable use of multi-sensory materials: sophisticated laboratory equipment and artistic materials plus a wide range of programmed and taped resources.

Since the capacity for independent study is not just one of the techniques of learning in school, but a chief end of schooling, there is every reason for the student to spend more and more time in this mode of learning as he matures, stimulated and guided by periodic meetings with teachers. Independent study might well occupy a full quarter of the student's time in the high school, particularly under a team-teaching organization.

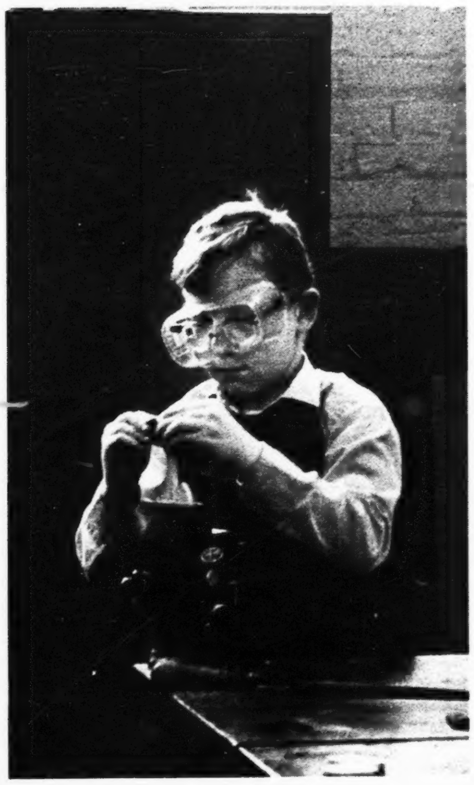


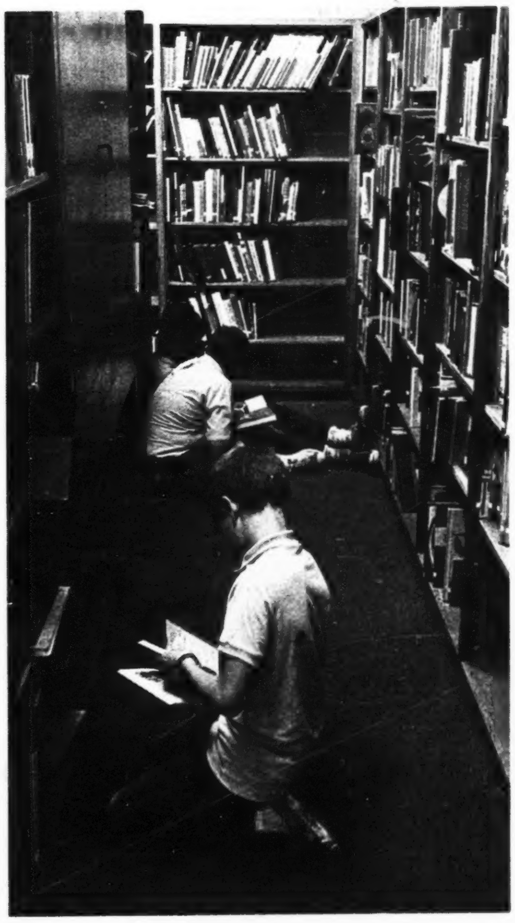
In all of this, the underlying purpose is to get the student engaged in his own education, setting his own goals, devising his own procedures, learning from his own mistakes. Through this stratagem much of the personal friction which so often exacerbates the instructional process can be reduced. Rather than feeling the teacher constantly hovering over his shoulder, the student can proceed at his own pace, responding to the challenge implicit in the task and to its impersonal demands for diligence, care, and imagination. It becomes clear to the student that responsibility for success is his. He knows when he succeeds or fails, not because an adult judges his work, but because a "responsive environment" tells him. This is, of course, an ideal of such independent study arrangements. But it is an ideal worth aiming for as we think about the kinds of environments provided in our schools.

3. DIALOGUE

Long before a President of the United States immortalized Mark Hopkins and his bench, mankind had accepted as the ideal mode of instruction the great teacher in discourse with a single student: Aristotle with Alexander, Johnson with Boswell, Anne Sullivan with Helen Keller, or anybody's moments with an unforgettable third-grade teacher. All the campaigns by teachers and parents to reduce class size seem to assume a one-to-one ratio of teacher to pupil as the unrealizable goal.

In point of fact, a steady diet of this intimate and intense confrontation would be as unwise





as it is impractical. It would be rather like eating nothing but anchovies or bonbons—or following an exclusive literary diet of the *Summa Theologica.* Too rich, too concentrated, too much. Dialogue makes special demands on the teacher, too, requiring her to be on the *qui vive* to the nuances and complexities of each one of many students. But it is equally true that schooling, to achieve full potency, needs an essential seasoning of dialogue, when it is most desirable.

The child's most important learning takes place, before he goes to school, in this face-to-face fashion. Most often with his mother, very often with his father, with a sister or brother or playmate, the young child learns how to speak, how to feed and dress himself, how to count—all the endless things that together form the most important and substantial part of his lifetime learning. His mother reads and sings to him. His father plays games with him or shows him how to bounce a ball, ride a bike, climb a tree. Toilet-training, colors, the sense of love or danger, relationships of all kinds—these the child learns with the help of another. Today there is belated recognition that the child who has had less than the normal share of such attention—the impoverished slum child, for instance, or the institutionalized child—comes to school basically unprepared for formal education. Special facilities, like the "tutoring booth" in nursery school, have been devised to remedy this condition.

Once entered in school, from nursery through high school and beyond, the student is apt to find himself in direct dialogue with a teacher for a very small fraction of the school or college day. When a school is organized into teaching teams, private meetings with a teacher or with two or

Shakespear

three teachers at once will probably be longer and more frequent. The exigencies of the self-contained classroom tend to limit the teacher's time for dealing with individual students.

In the bad old days, which are not wholly past, the implication of meeting the teacher alone was often ominous ("Jimmy, you will kindly remain after school" . . . "She's watching you" . . . "Oh oh—here she comes to see what you're writing"). Good schools nowadays have pretty well erased these overtones. At its best and most fruitful, the meeting of teacher and student is a true dialogue—a two-way relationship where both sides gain in knowledge or insight. Particularly in the later years of schooling, guidance and joint exploration supplant exposition when student and teacher confer.

An intimate environment is often required to make the most of student-teacher give-and-take. A psychiatrist would not think of setting up his couch in Grand Central Station. Though conferences can be conducted by pulling a chair up to the teacher's desk or by using two chairs in the student's own work space, a well-designed school should provide small spaces where, among other uses, a teacher and student may talk together with a fair amount of privacy. These spaces can include: small conference rooms; a lounge area, patio, or casual reading corner; offices; an area in the library and/or laboratory; and at the very least a work table in the corner of any standard classroom.

Dialogue is, or should be, the fine cutting edge of the instructional process. Here the teacher, face to face with the student as an individual, finds the opportunity to discern those qualities that

make this student different from all others. If the teacher exploits this potent opportunity to the full, his guidance and inspiration can help focus the rest of the student's school experiences.

Sometimes such meetings are set up in advance, initiated by either side. But the happiest—and most educationally effective—dialogues may be unplanned and casual. Teacher and child happen to walk from one class to the next together, or they converge on a particular corner of the library, or they may meet by chance out of school. Often the important one-to-one impact can be quite fleeting, in the midst of a sizable group: a teacher's approving smile or encouraging question after a student's presentation, for instance; or a teacher's momentary stop beside each student's desk when a class is involved in a group presentation.

In general, dialogue precedes and also follows independent study. The teacher provides the "something" to get the child's own exploration started—in Jerome Bruner's triad—then the something to keep it going, and to keep it from being random. In nursery school and kindergarten, the teacher helps each child separately to tie his shoes, to use colors, to work the record player, to get the hang of puzzles. She will also test him individually and decide if he is ready for arithmetic and reading. If she is not overworked she will also do a good deal of one-to-one loving, listening, and mopping of tears, to say nothing of nose-wiping.

Through primary school and up to the time children are 12 or so, the teacher continues to work in this way with the individual student, making sure he understands directions for new pursuits and helping him with work that gives him trouble. Around the middle elementary years,

as students take on more independent work, the teacher-student dialogue often assumes the form of conferences before and after a project and perhaps midway. The teacher still takes time to help the individual student with difficult work and to give him general counseling and advice.

By the middle school years or somewhat sooner, the tutorial approach still serves a minor remedial function, but principally it enables the teacher to appraise the student's progress and to spur him on to further independent work. And so through high school and into college, where dialogue between student and professor is rarely wasted on remedial work.

In a school keyed to the encouragement of independent study and individual progress, a typical one-to-one relationship of teacher and student might follow these phases: 1. As a student starts a new project, the teacher discusses with him the possible directions it could take, perhaps helps him to choose one, and gives him some notion of likely resources; 2. At midpoint in the project, the teacher may want to check on how well the student operates on his own, and so may question him, or guide him if necessary, or merely look and listen; or the student may want to check his own progress or discuss his problems; and 3. At the conclusion of the project, the teacher appraises it with the student, and together they work out next steps or new projects.

4. SEMINAR: SMALL-GROUP DISCUSSION

The small seminar—12 persons or fewer—may well be the most important group size in formal education, and the most difficult to achieve in schools of conventional design. Independent

study and conversations between individual students and teachers can always be managed off in a corner somewhere; large groups can convene in the auditorium or gym. But it takes some contriving to arrange appropriate places for small groups of students to meet with or without a teacher. We borrow the word "seminar" from its usual university context because the kind of activity envisaged is essentially the same.

Such meetings seem increasingly important to educators. "Really effective discussion of important content develops best in small groups of no more than 15 persons," says J. Lloyd Trump. "In schools where the classroom is the unit of organization, teachers should organize learners frequently into smaller groups of varying types and sizes," The National Education Association Project on Instruction recommended. Why is there this consensus on the desirability of small groups?

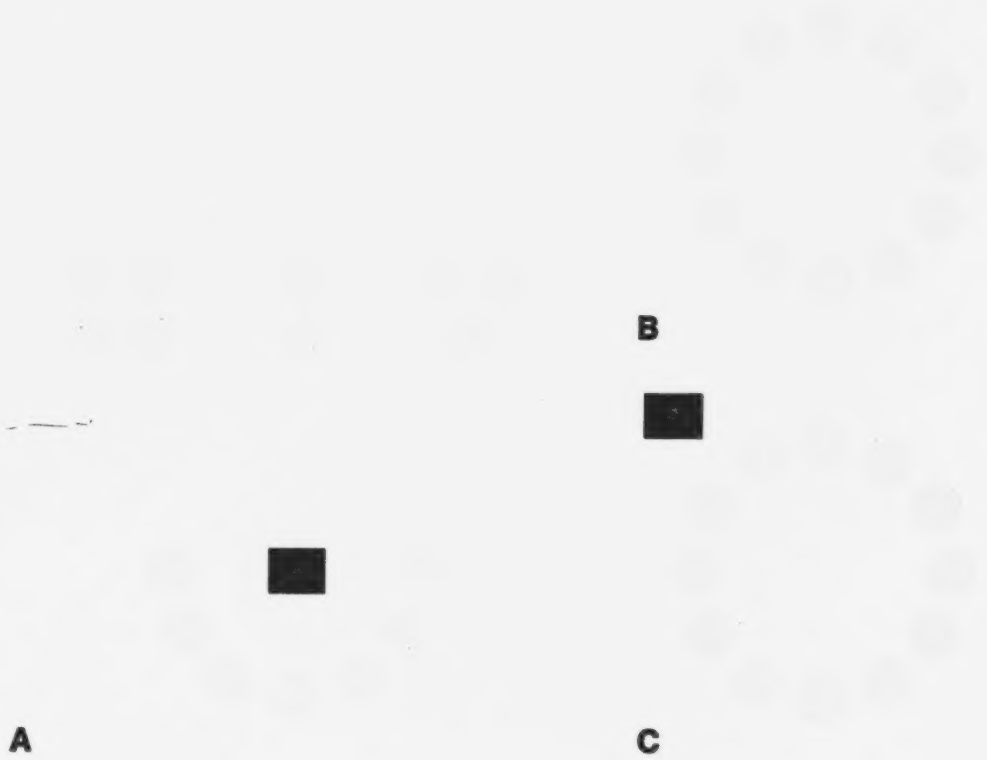
The reasons are not far to seek: they are the reasons why educators have striven so long for smaller and smaller classes. But certain new emphases sharpen the focus: contemporary research in the behavioral sciences has indicated rather dramatically that the small group offers unique opportunities for individual intellectual growth through the friction and stimulation of genuine conversation. The group of 12 or fewer, skillfully guided, can provide a student with the powerful experience of listening, presenting his ideas to others, and working his way through intellectual and emotional difficulties. For one thing, there's no "back of the class." And silent headshakers, or dominating know-it-alls, can learn by having to fit their contribution into a small group like this.

For students who are ready for the experience, the small group provides the setting for real intellectual enterprise.

Sometimes the group will have a specifically *tutorial* purpose, and the teacher will compose it rather carefully according to some common denominator of achievement or interest. At other times 10 or a dozen youngsters will gather together more casually, to work on a project, exchange ideas, or arrive at some decision.

A small group of students working together *without* a teacher offers certain pedagogical advantages otherwise unobtainable. The students, deprived of an authority figure to whom they can look for the final word, find that they must work out their divergent reactions to materials or their conflicting approach to problems within the group. In no other way can students so powerfully perceive some of the basic postulates of scientific method: personal variations in seeing facts, in making inferences, and in arriving at conclusions and judgments. Studying alone the student does not bump up against these disturbing but stimulating discrepancies; with a teacher or in a large group he need not confront them directly. In a small group, students reach for understanding not by accepting what is presented by another person or indirectly by a media of communication, but through give-and-take with their peers—a process often frustrating, always complex, but sometimes exhilarating.

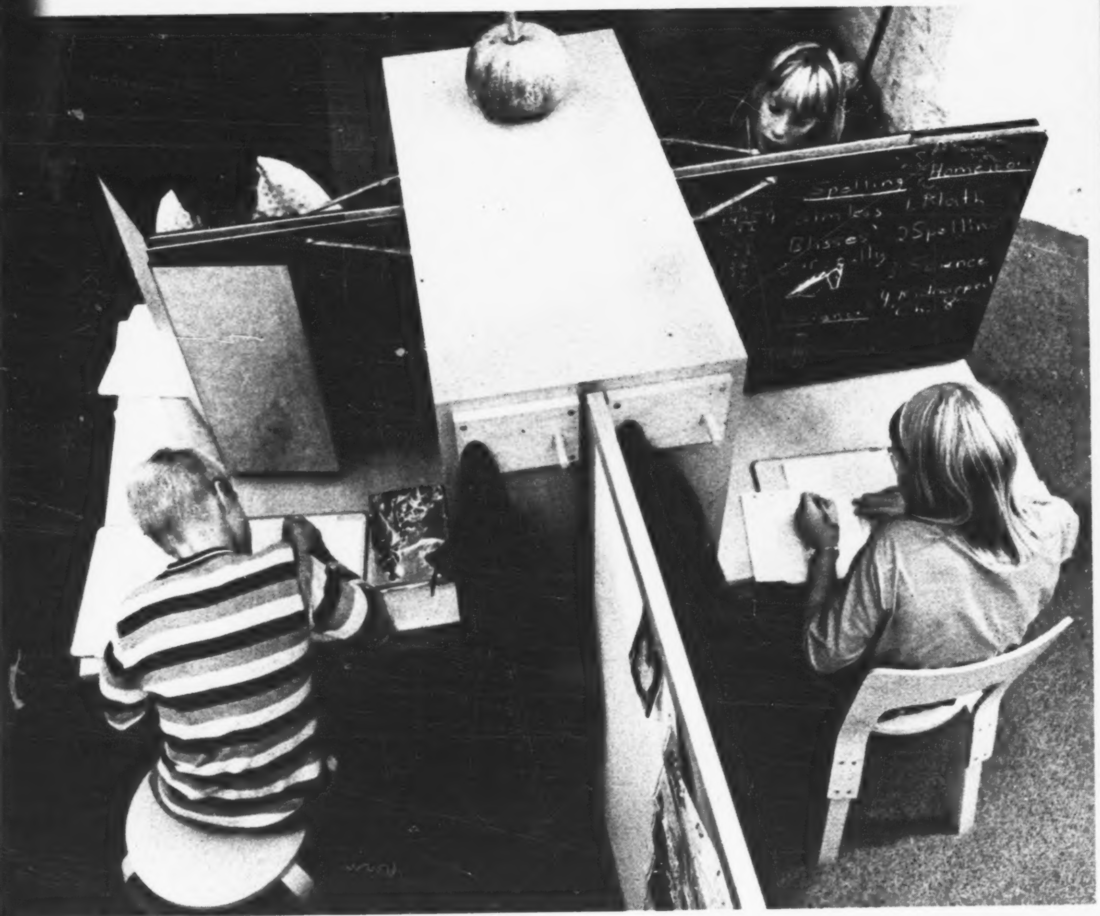
The small group is primarily useful for interaction—controversy, debate, side-taking, opinion-forming. It also lends itself occasionally to one-way communication, either from a teacher



or one of the students. The examples above diagram various possibilities in the way of relationships, both with and without a teacher. In Example C, the teacher stands aside and observes. In Example B, the group is on its own. The teacher can sometimes divide his or her attention between two groups of a dozen or so each. Thus, as in example A, the teacher might work directly with half the children while the other half works on its own.

The seminar group can profitably use all the devices that children use independently—tape recorders, microfilms, books, charts, maps, and globes, etc.—and also some of the devices used for large-group presentation, such as the overhead or rear-screen film projector, telephone, phonograph, TV, or slides.

The small child usually has experience with groups of a dozen or so before he comes to school, perhaps in Sunday School and certainly in family gatherings and neighborhood birthday parties. Then, in his earliest school years, he will find himself in one or another small group that teachers put together for special purposes, such as reading groups organized according to level of readiness or achievement. The proportion of time spent in these special small groups increases during the primary years when children are learning the basic skills, and it is particularly important to divide them into teachable groups. In a school organized for team teaching, children may spend close to half their time in such small groups; in the self-contained classroom, considerably less. The proportion holds more or less constant through elementary school, with the small groups spending an increasing amount of time in discussion and in working together on common projects.



In many ways this rather close relationship of one teacher to 10 or 12 children can be the backbone of learning in the middle school years and high school. The student, working with a few fellows, becomes actively involved in the exchange and testing of ideas and concepts. The teacher is less in evidence, but available for guidance and direction. The seminar mode takes many forms—the discussion-participation group, the laboratory team, the library project group, and small-group projects in most subject areas. And the seminar is, of course, a highly significant part of education in college and beyond.

5. PRESENTATION

There are two chief arguments for the educational use of groups numbering more than 30, even up into the hundreds. One is that any presentation that a teacher can effectively make to a class of 25 or 30 she can make more economically—and, through the use of expensive technology not justifiable for conventional classroom use, more effectively—to a far larger number of students. The second argument is more compelling: the use of large groups, wherever appropriate, releases that much teacher and student time for independent study or for study in small groups. Large-group instruction has its own, highly circumscribed, virtues. But its chief virtue is that it permits other modes of learning to flower.

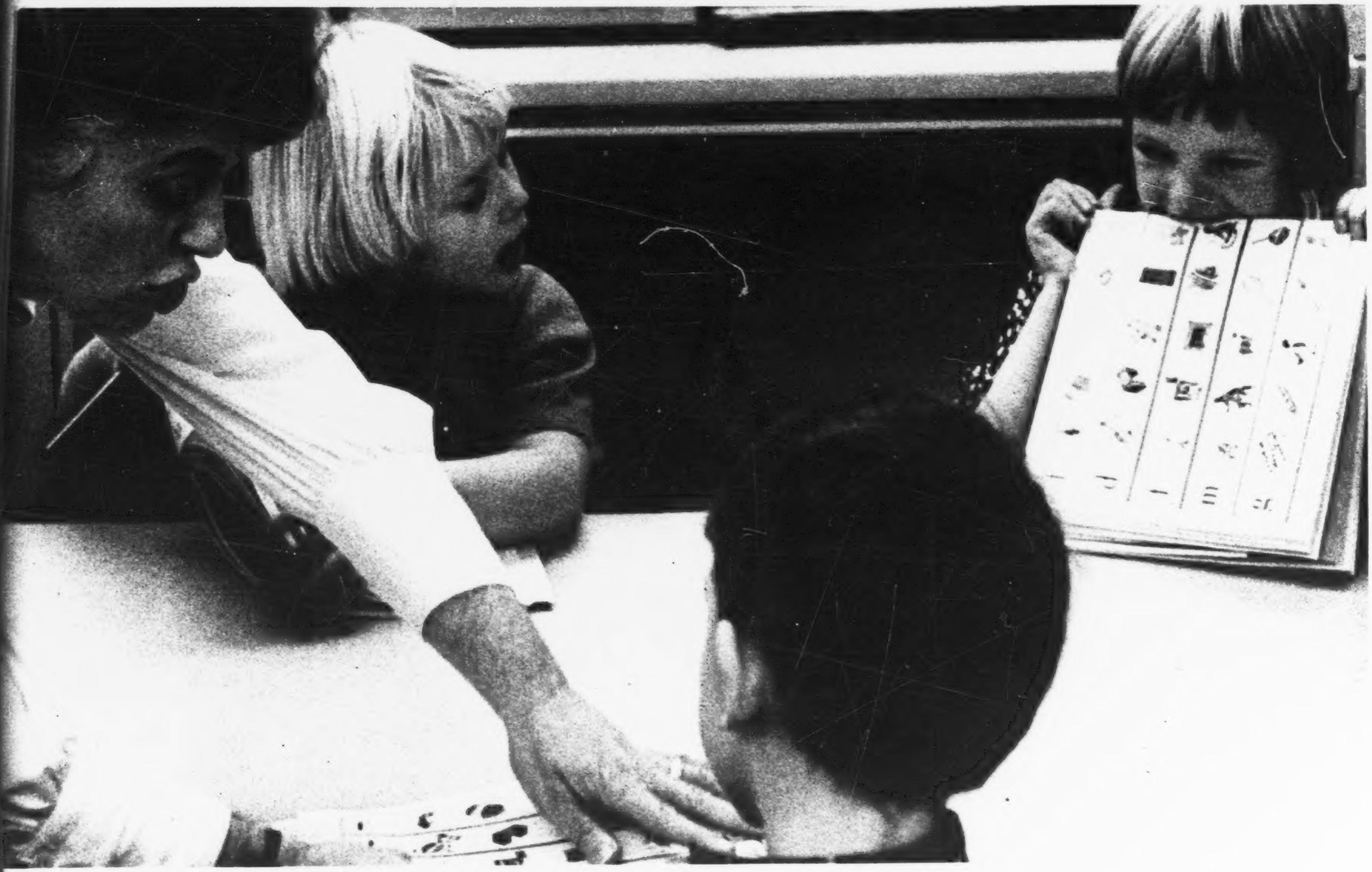
Modern advocates of large-group teaching have had to battle a barrage of prejudice and misunderstanding. It is difficult to convince schoolmen and parents that "large group" is not a

synonym for "big class;" that it is not a reactionary counter-measure to everybody's belief in small classes; that it is not a latterday version of the nineteenth-century's Lancastrian system that marshalled 500 robot-like students in military ranks. And once they have made their point, these advocates have to keep eager disciples from going over the side to overuse and misuse large groups.

Large-group presentation is usually pure one-way communication. Besides the traditional uses for theater, music, and such, it is an efficient method of reaching many students at one shot. The teacher tells; the students listen. Properly used, it presumes a body of information that is of importance and use to a number of students. It presumes further that this group of students is *ready* to use the information. A good school does not herd dozens or hundreds of children into a lecture or demonstration without first making sure they've developed the art of listening and the skill of note-taking. Most important of all, the large-group presentation should stimulate the student and point the direction for further work on his own or in discussion or small work groups. What goes before and what comes after determine the value of the presentation.

Obviously a large group needs a large space, indoors or out. But it does not have to be one-purpose space. The well-planned school usually designs its large spaces so that they are suitable for a variety of large-group activities and are also easily divisible into a collection of useful smaller spaces.

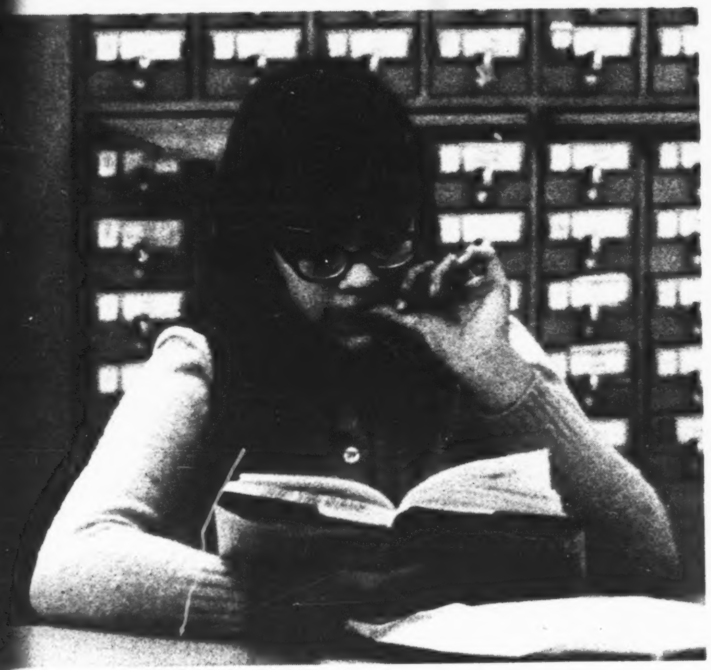
Many of the major resources of educational technology come into full play only when applied to the large group. A number of devices integrated into a system—projection television,

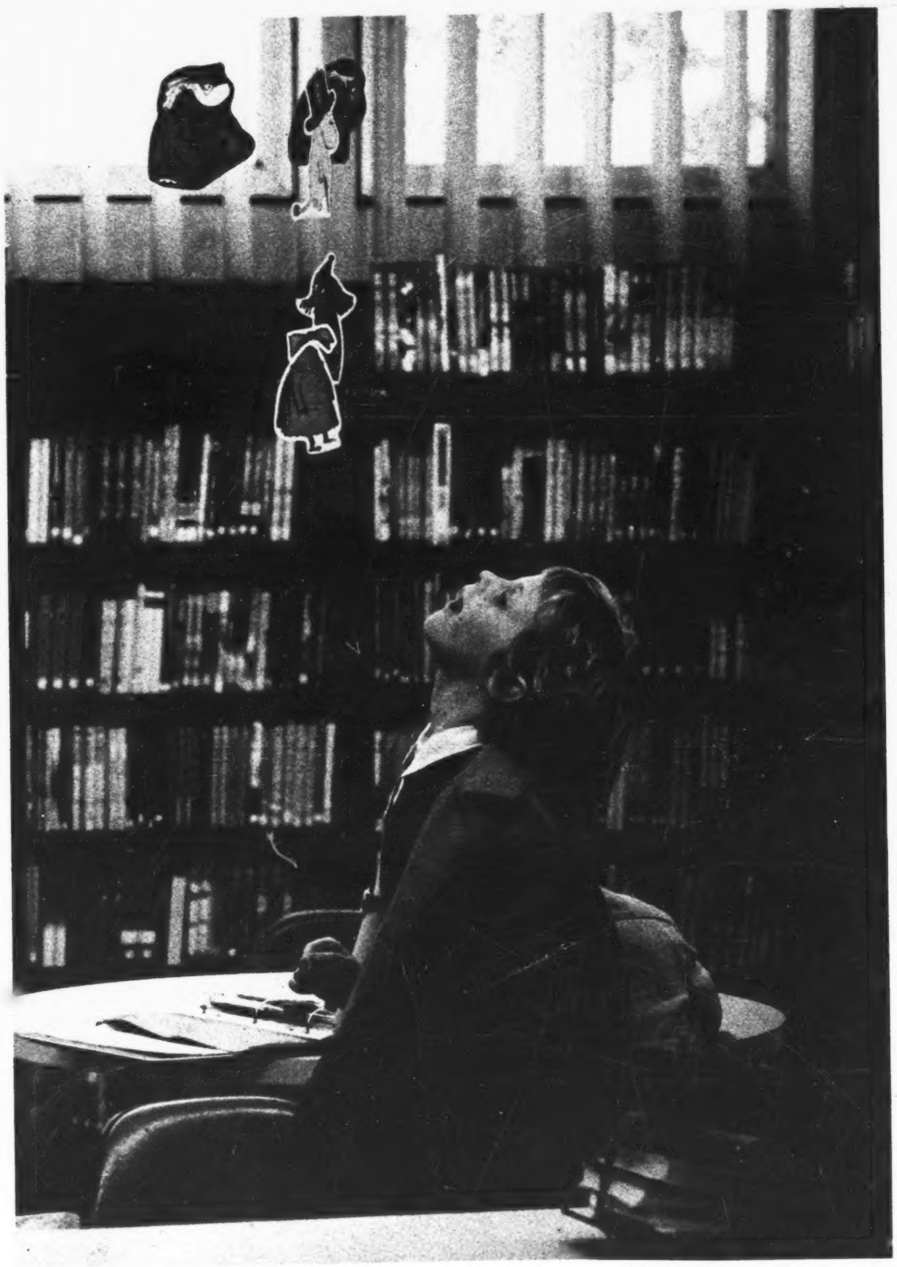


film (including 16mm), slides, radio, the phonograph, audio- and videotapes—can even make the presentation a "teacherless" performance. Moreover, advancing technology may permit the eventual decentralization of "canned" instruction. Some educators at the forefront in this area foresee a movement away from the gathering of hundreds of students under one roof, to the dissemination of instruction to thousands of individual, smallscreen receivers, with each student having a multi-channel choice of presentations. But the widespread use of such developments is still a decade or more away, and in the interim many schools could clearly benefit from special facilities suitable for large-group instruction.

The live teacher, too, when lecturing to a large group can draw upon a variety of additional resources, including the overhead projector, slides, the microphone, and the telephone for open-circuit conference calls. He can use closed-circuit TV to bring an experiment close to the audience. Emerging technology even promises to counter the general rule that the large group is limited to one-way communication. It is now technically feasible to rig up automated feedback mechanisms—a set of controls at each student's seat by which he may respond to questions. Their educational value remains to be proved.

The little child has frequently found himself in large groups long before he reaches school—at the movies or the circus, at church, in a restaurant, at community ceremonies of various kinds. (Of course, much of what he learns stems from his own small group within the large one.) In nursery school and kindergarten, a teacher or two will often combine classes for trips, movies,





visiting speakers or performers, physical education. Sometimes the whole staff and student body will join together for a school assembly. In the early years, large groupings seldom occupy much school time. As the child moves into the primary grades, he may be part of such groups more often, as his attention span increases.

From the middle years of elementary school and on through high school, the large group can serve a more important pedagogical function, particularly in the school organized into teaching teams. Almost always, as noted above, the large-group presentation is designed to stimulate a largely passive audience; the payoff results from careful preparation and follow-up. It has proved more suitable for certain subjects in the curriculum than others. Educators have also found the large group valuable for the development and practice of certain skills, notably typing.

In formal education beyond the high school, students can benefit from a significant increase in large-group lectures or presentations. The use of televised courses becomes more important. And there is a growing interest in the potential of single taped lectures by great scholars or artists, a technological parallel to the role played in the English universities by visiting lecturers. In fact, with the advent of cheap videotapes which might be exchanged, and international telecommunications via satellite, the possibility arises of bringing the world's people and events into the school.

III The Schoolhouse

INTRODUCTION

This final section considers how spaces can be designed to accommodate the modes of teaching and learning we have discussed and how these spaces might relate to one another within a school. Also we hope to indicate how, through the imaginative use of materials, furniture, equipment, color, and lighting, the total environment can be enhanced.

The drawings on the following pages are in no sense intended as *plans* for schools. The reader should not be put off because he finds no indication of fire exits, or toilets, or boiler rooms, nor should he wonder at the absence of gym or cafeteria, nor try to adapt the sketches to the constraints of particular structural systems, of downtown urban real estate, or of particular school regulations or budgets. Our point is to bring together some of the best current ideas on environments for learning, not to develop a guide for school building.

This book assumes that there is a useful purpose to be served by looking freely and boldly at educational problems, at the most promising solutions, and at their design implications. Perhaps the vision of what a school could and should be in order to facilitate the best education for all children may help change the very obstacles which now make such a school improbable or impossible. "In dreams," wrote Yeats, "begins responsibility."

The spirit which informs these designs is the spirit of change; therefore they stress flexibility, variety, variability, pedagogical receptiveness—above all, a quality of openness, both human and architectural. These are environments intended to accommodate and encourage self-renewing innovation in the students, teachers, and administrators who work in them. In schools designed along these lines, teachers will not work like independent practitioners isolated behind closed doors. Rather, they will work in a cooperative, busy—even bustling—setting where individual enthusiasms, energies, and talents constantly on display produce a richer and more satisfying experience than any single teacher could provide. The conventional barriers between students and teachers, teachers and colleagues, teachers and administrators, are all breached by the school's intrinsic design. Visibility, congeniality, independence, and constant interchange would be the natural mode encouraged by such surroundings. Students constantly see teachers at work, active, busy; some of this spirit will certainly rub off on them, and vice versa.

Is an environment like this entirely unrealistic, out of touch with the facts of school life? What about the disciplinary problems that have discouraged so many teachers and principals, the experiences in and out of school that have alienated so many students and teachers? Certainly these conditions abound, especially in the urban ghettos, and their victims—children or adults—might react adversely to this new kind of school, and could even undermine the enthusiastic response of other teachers and students.

It is only fair to acknowledge that this is a school for essentially sound students, teachers, and administrators. The design does not provide for making up for severe deficiencies, repairing badly damaged young minds, or squeezing imaginative change out of demoralized teachers. But if educators are to seize the exciting new opportunities now opening up, designs like these for the school of the future must exist, even if only as a "probe," a hypothesis, a target for criticism, refinement, and improvement.

THE PRE-PRIMARY SCHOOL

Well over half of all the growth in a child's intelligence takes place before he enrolls in school. Today even if he is lucky enough to live in a district that offers kindergarten, his program is apt to be based on outmoded ideas about the kinds of things which very young children can learn and want to learn.

But demands for change are coming strongly from many directions. Educators are trying, through programs like Head Start, to intervene earlier in the lives of children and to provide those social and sensory experiences which stimulate later learning. A number of new programs stress youngsters' needs for real academic work, building on their exposure to television and to the wealth of experiences most middle-class parents give their children. And bolder scholars and scientists are suggesting that even our newly enlarged notion of youngsters' capacities may soon be anachronistic. Studies of the human potential are pushing forward, and the old measures of readiness and intelligence are being swept aside, "We've got a bear by the tail," Jerome Bruner says of current findings.

It will be a long time before enough returns are in to validate any firm prescription for pre-primary education. However, several things are already clear. One is that a school trying to cope effectively with four- and five-year-olds must be prepared to offer a whole range of diverse experiences and to be acutely aware of the range of individual differences, even though these differences become greater later on. Another is that the old standard kindergarten formula—so new and daring in its day and still far from universally accepted—must undergo sharp revision. Since children differ so radically in their development and expectations, the pre-primary (or "kindergarten") classes in their very organization must take account of these differences. The pure play offered must be richer and more varied for the children who have had little enough at home. By the same token, the school must offer academic instruction till recently unthought of (or condemned as pushing) for the youngsters more than ready to read and write and figure.

In general, it appears, public school systems will begin accepting children younger than heretofore: eventually, spurred by the anti-poverty program and other national developments, they may take over the function of the private nursery schools and what are now ordinarily called "day nurseries."

A pre-primary school like that drawn on the facing page would seldom be established by itself and *de novo,* except perhaps as a child-development research center. In affluent or well-subsidized school systems, it might be an appendage to the primary school; in others, it might be set up as a church-basement or storefront operation.

If schools are to be nongraded—if children will really progress at their own pace and have their individual differences taken into account—then an obvious place to start is at the beginning. One way to break the lockstep of the traditional timetable and school calendar is to abolish the conventional minimum-age requirements for beginning school. A simple device might be to welcome every child to school on the first of the month following his fourth birthday, whenever it occurred. Small groups of children would thus enter school each month. The process would be easier for child and teacher than the conventional entrance system rigidly keyed to birth before or after a given annual date.

The school illustrated here accepts children on this basis and thus a testing center—to determine as well as possible a child's degree of social, emotional, and intellectual development—is an essential element.

It is actually much like a very small nursery school, manned by a teacher and an aide, with perhaps 12 children at any one time occupying themselves with paint, blocks, instructional toys, and paper work of various kinds. The adjacent triangular area is the observation room where, behind a one-way mirror, staff may observe the children and decide where they belong in the school's program.

To the left of the drawing appear the school's chief spaces for instruction, once the children have been more or less sorted out. The one at upper left, Room A, is for the kindergartners who seem least mature. This would correspond roughly to a good nursery school or kindergarten, providing lots of large-muscle action, manipulative toys, and puzzles; blocks and trucks and tractors; a corner for playing house; space for arts and crafts, singing, and dancing. Just below, the area for the more grown-up kindergartners, Room B, offers more sophisticated activities, many of them centered around learning to read. There is a wealth of books—picture books and others—plus science displays including small animals, problems to solve, and projects of many kinds, plus water and plant life. This area (Room B) would make use of simple audiovisual devices—tape- and disk-recorders, overhead and slide projectors. Screened off to one side, as the drawing shows, are several teaching typewriter setups.

In between these two instructional areas, the scheme suggests a little projection arena, labeled a "Theaterette." Here sliding panels enclose a small audience of preschoolers to view all kinds of images and environments, projected rear screen. Sometimes the children witness well-programmed multiple slide projection shows, at other times simple slide shows. The sketch on page 44 shows how such a theaterette might work.

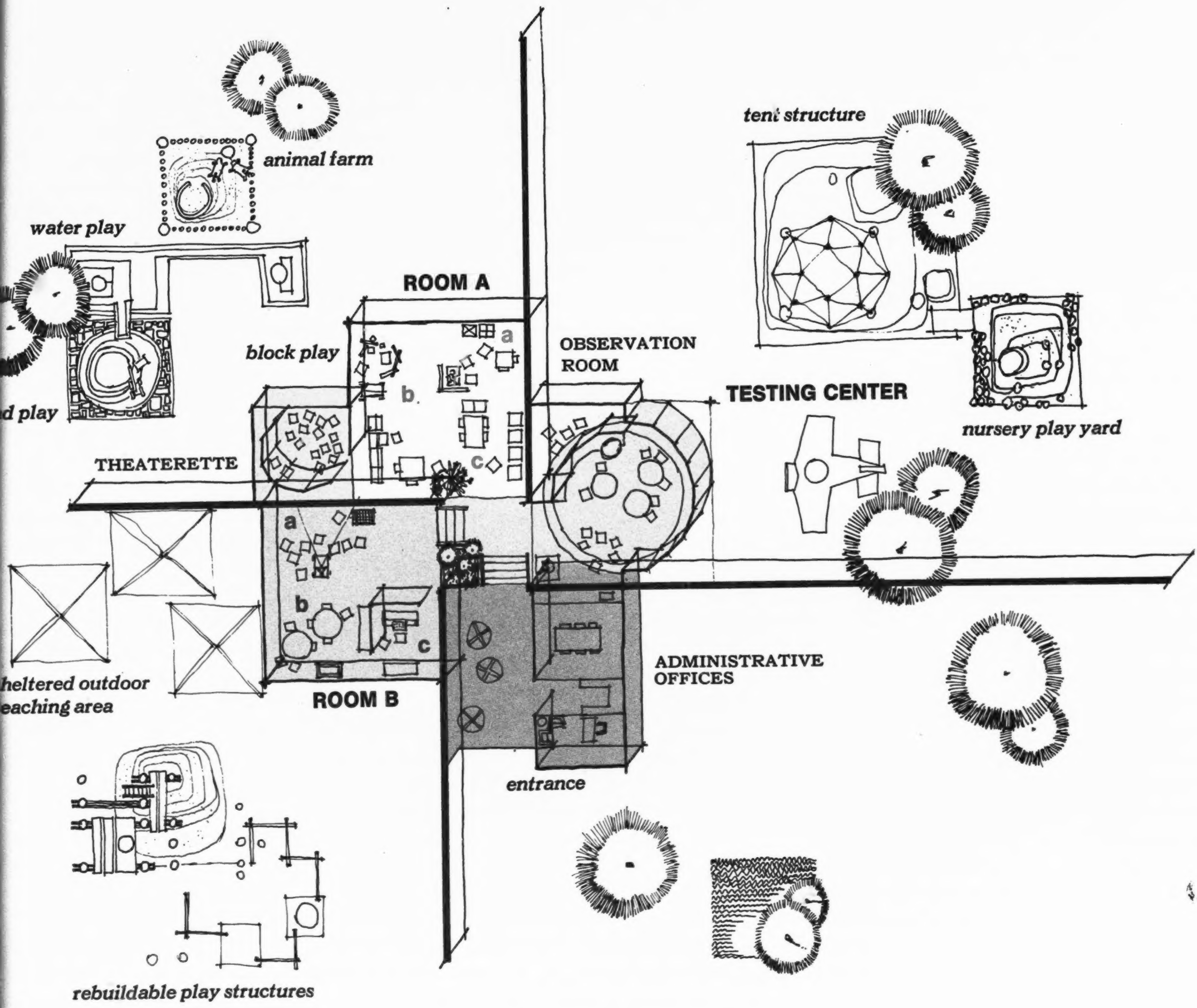
Around the margin of the pre-primary school run outdoor spaces related to those inside. Outside the testing area, for instance, is a little playground. As the drawing suggests, it contains a mock-up of an airplane in which the children can play or act out roles, tunnels and sand, and a tent hung from a geodesic frame. Outside Room A would be a playground designed for very young children, with a good big sand pit. The sketch suggests a farm-like setting, with a variety of animals that the children would learn to take care of. For the more advanced children, the outdoor area would offer more complex doings: structures that the children could work into their own imaginings, and big modular blocks that the children could build into anything that struck their fancy—a cave to hide in, a clubhouse, a submarine, a fire engine.

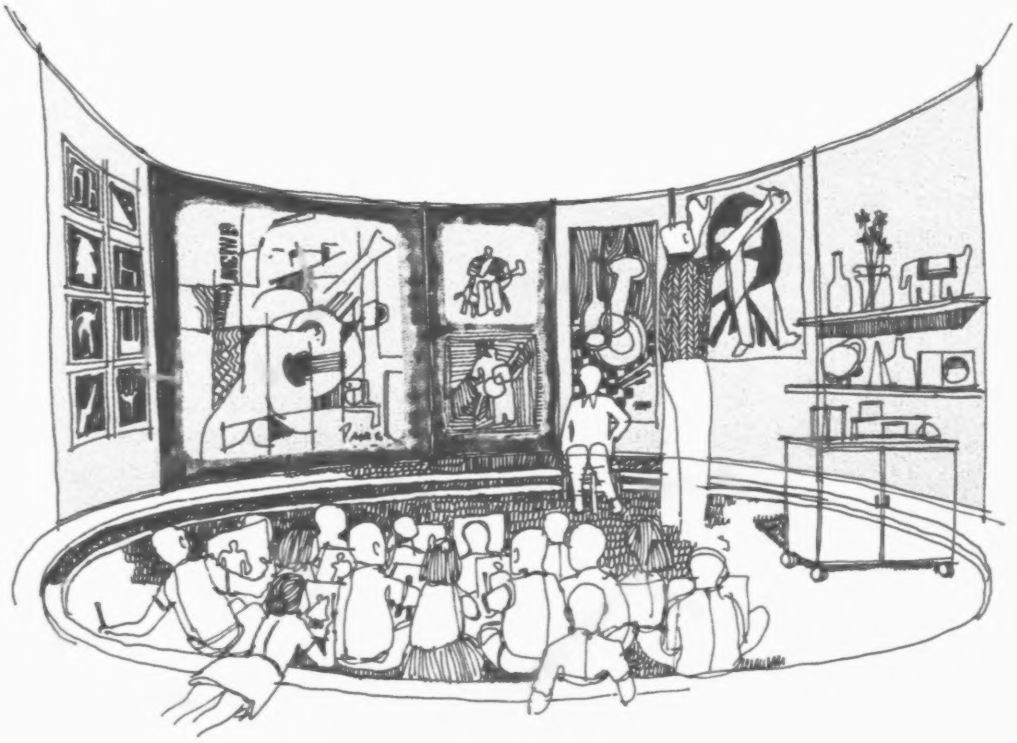
ROOM A

- **a.** *housekeeping*
- **b.** *manipulative toys*
- **c.** *arts/crafts*

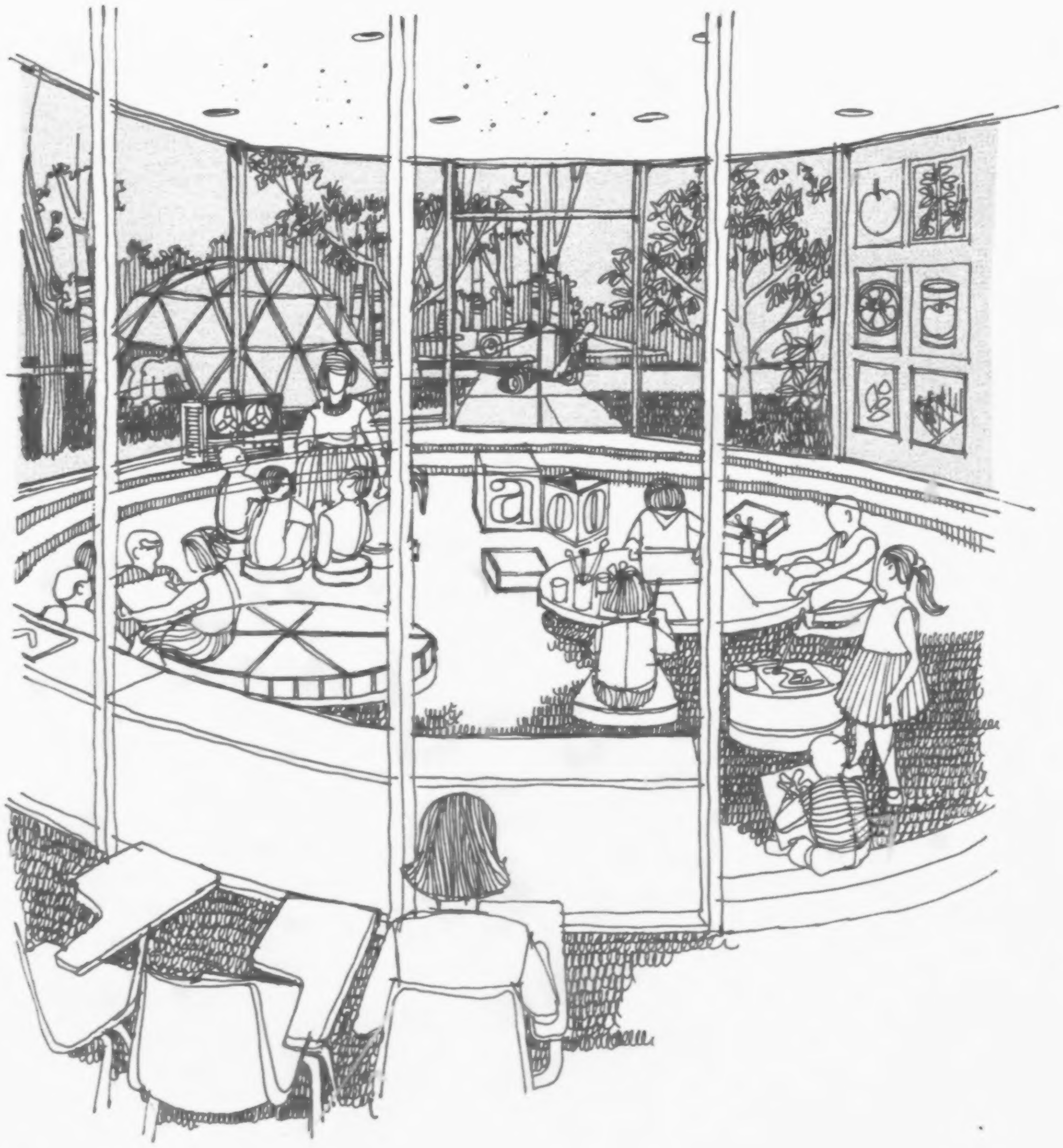
ROOM B

- **a.** *presentation*
- **b.** *science projects*
- **c.** *study and tutoring*

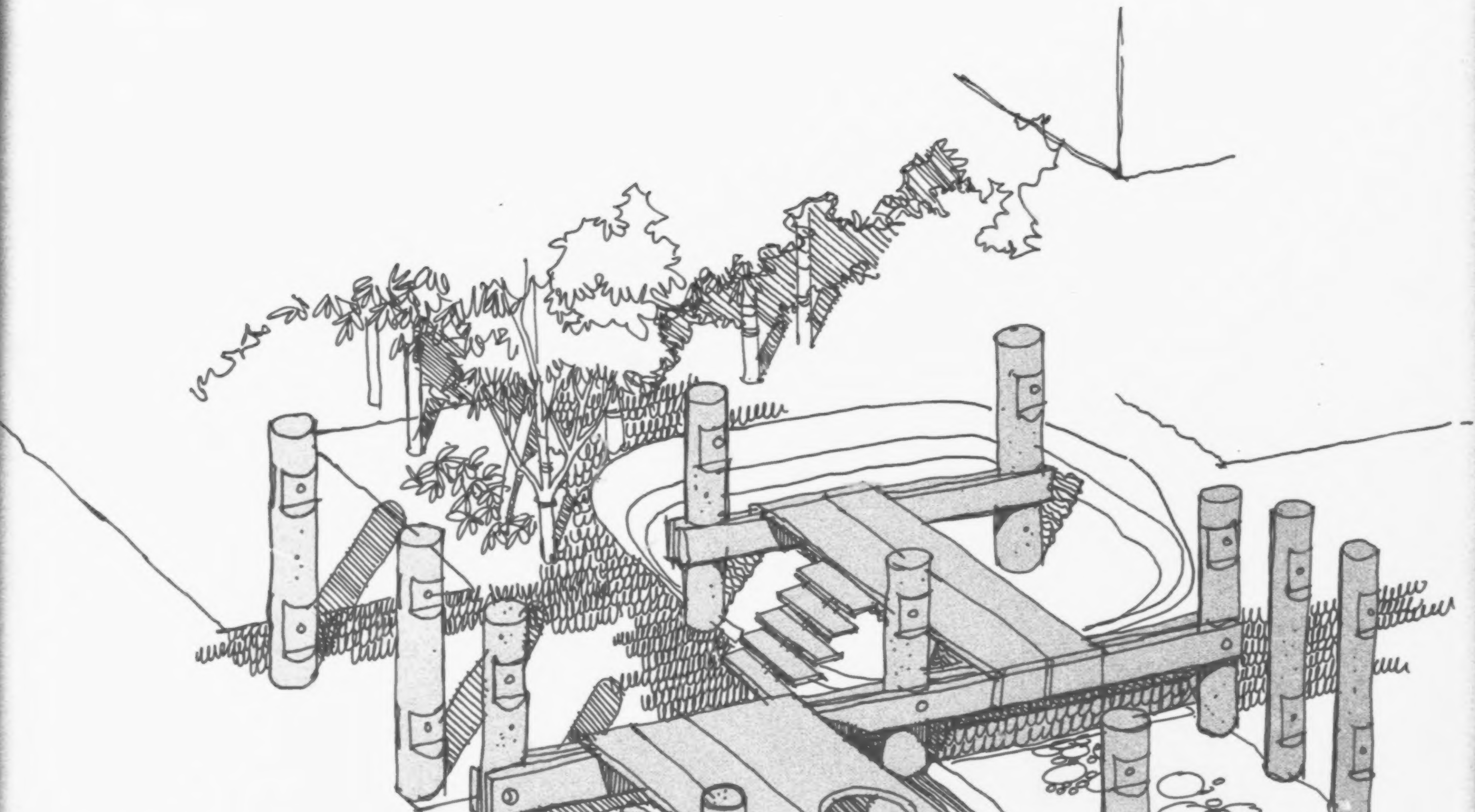

animal farm
water play
ROOM A
a
b
c
block play
d play
OBSERVATION ROOM
TESTING CENTER
tent structure
nursery play yard
THEATERETTE
a
b
c
heltered outdoor
eaching area
ROOM B
ADMINISTRATIVE OFFICES
entrance
rebuildable play structures



THEATERETTE



OBSERVATION ROOM



OUTDOOR PLAY AREA

THE PRIMARY SCHOOL

Today it has become increasingly clear that primary education, as conventionally carried on, is not nearly good enough. Only recently, for instance, a major study has shown that the strides made by preschool children in Head Start programs tend to be rapidly negated by their experiences thereafter in run-of-the-mill primary schools. In the primary school years, the child masters —or should master—the basic tools of learning essential to all his subsequent education. Not only must these schools devise better ways to teach the three R's, but they must also endeavor to preserve and foster, in the process, the child's natural curiosity, energy, and imagination.

The themes of the primary school illustrated on pages 48–49 are flexibility, diversity, and accessibility.

Flexibility provided by space-dividing devices, permits teachers and administrators to organize instruction in any way they wish and to select or manipulate a correspondingly appropriate setting, from the conventional self-contained class to fluid, instantaneously variable arrangements.

But the scheme shown here goes beyond the mere facilitation of more open or more closed floor area in simple multitudes of a given plan module. Unlike the traditional school with its homogenized monotony of vertical dimensions, this scheme provides a range of spatial environments to suit various purposes.

Diversity in the scale of space available permits selection of the appropriate three-dimensional (architectural) environment for each reasonably predictable activity: high-ceilinged, lofty space for large groups or vigorous action; versatile, medium-sized areas approximately the size of the standard classroom; small intimate, low-ceilinged alcoves suitable for individual study or tutorial work; finally, adequate and well-designed space where teachers can talk, plan, work, and just relax. The design means, in short, that there can and should be a real change of pace within each teaching area.

Accessibility, in this design, means chiefly that the *means* of instruction are readily available—that teachers and students can command the resources they want at a particular time, fast, with a minimum of red-tape, paper work, and trouble. The range suggested here is wide: from a child's ability to talk to a teacher when he most needs him, to the teacher's ability to invoke TV promptly when she wants it.

Each of the four clusters composing this particular primary school is identical in form: a central high-ceilinged area surrounded by four average-height teaching zones and four smaller and more intimately scaled alcoves. They surround the central library core, with the teachers' work areas acting as a bridge between each cluster and the library. The scheme shows a transition from the standard, self-contained classroom to a free-wheeling open plan for instruction. The purpose is not to suggest that an actual school would or should provide this kind of transition as a child progresses through school, but rather that with this kind of flexible design, the school itself could make the transitions, from a completely conventional arrangement with all four clusters arranged in self-contained units (as in the first cluster) to a completely open plan with all the clusters as open and adaptable as Cluster No. 4.

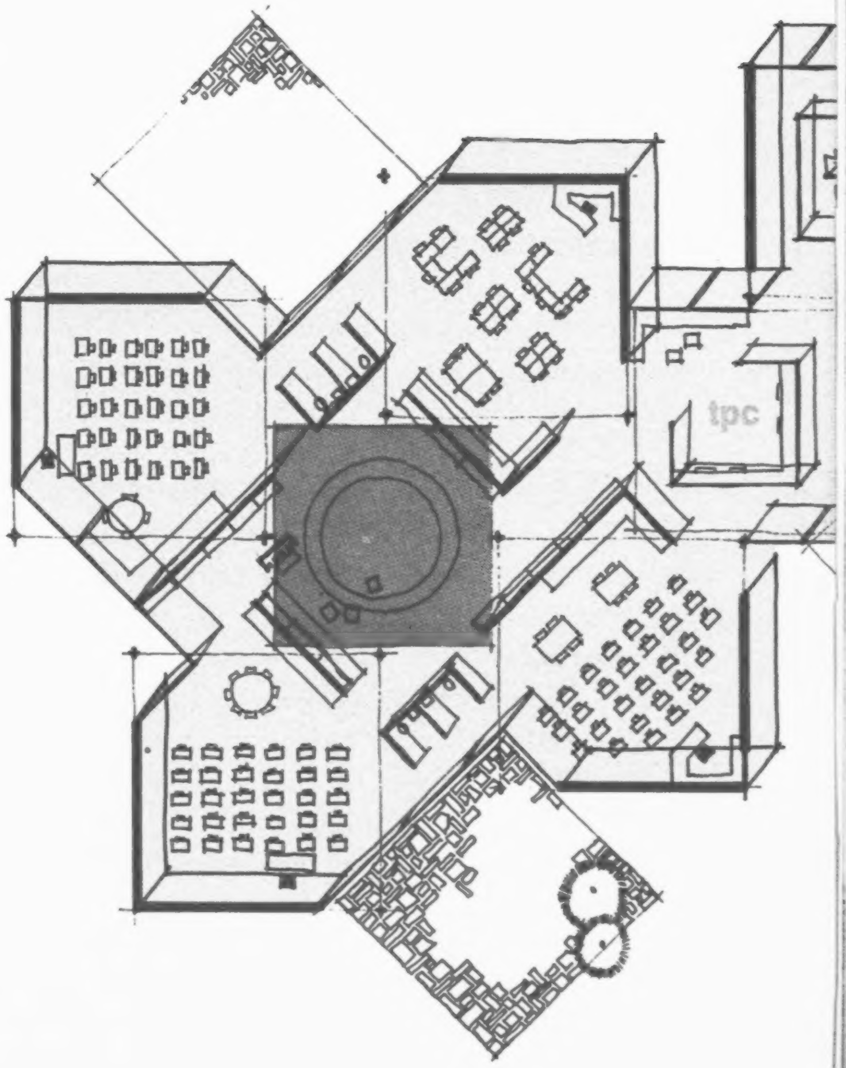
The cluster at the far left of the plan is set up for conventional teaching, with each of four classrooms enclosed within its own four walls. Passing clockwise to the second cluster, operable partitions link the different teaching areas so that class activities can move easily, overflow into the shaded central space, and from there into any of the other teaching areas.

The third cluster shows a more fluid arrangement of the operable partitions and a more cooperative organization for teaching. This could permit a student to transfer more readily from one group to another, depending on his degree of proficiency in a given subject, or his particular academic or social needs. The partitions can be drawn around two or three classes gathered together for a lecture or demonstration in the central arena. At the same time the arrangement produces smaller enclosed spaces for groups of students working on special projects.

Finally, the fourth cluster shows the ultimate in fluidity and flexibility. There are no fixed walls nor even operable partitions: the whole space is thrown open to permit the easy interchange of teachers, pupils, and resources. Light "skiddable" walls—screens—improvise small spaces as needed to contain or screen activities. Complete acoustic isolation is not necessary: general sound-dampening is produced through the use of carpeting, the space between learning groups, and the shape and texture of ceiling planes.

The drawings which follow show an enlarged perspective of this fourth cluster and of the all-important library, with its variety of simple mechanical and electronic tools, together with printed and programmed materials of many kinds. Cluster No. 4 is what many imaginative educators consider an ideal environment for gearing instruction to the individual child and for fully capitalizing on the varied capacities of teachers and instructional resources. Conducting education in this flowing space presumes an advanced degree of cooperation and joint planning. Teaching becomes a full-fledged team activity. The teachers make multiple use of their special work area—for conferring with team members, meeting occasionally with other teams, reviewing and planning work, developing instructional materials, and conferring with parents.

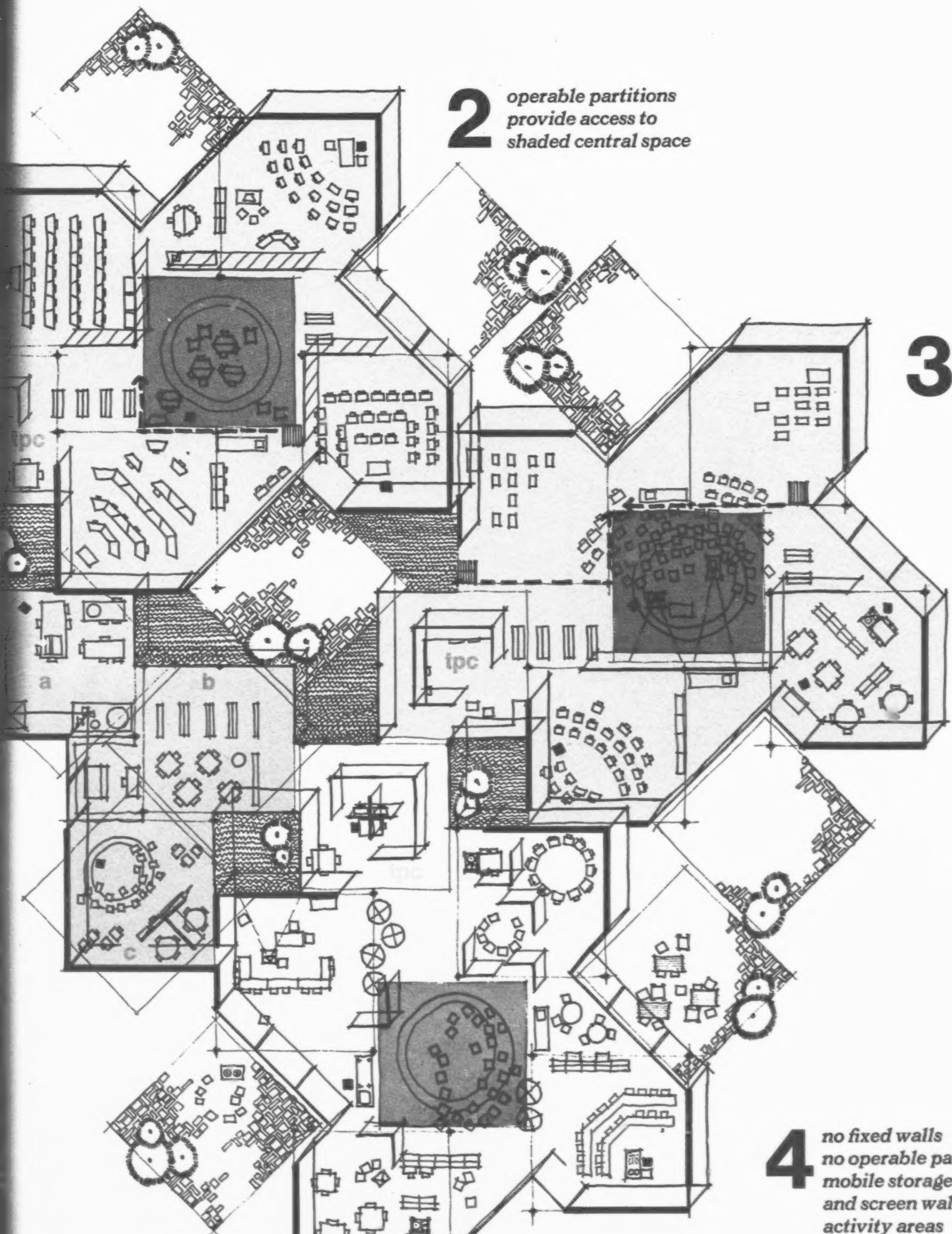
1 *conventional*
self-contained
classroom division



Library ▨

a. *projects and exhibits*
b. *books and materials*
c. *viewing and listening*

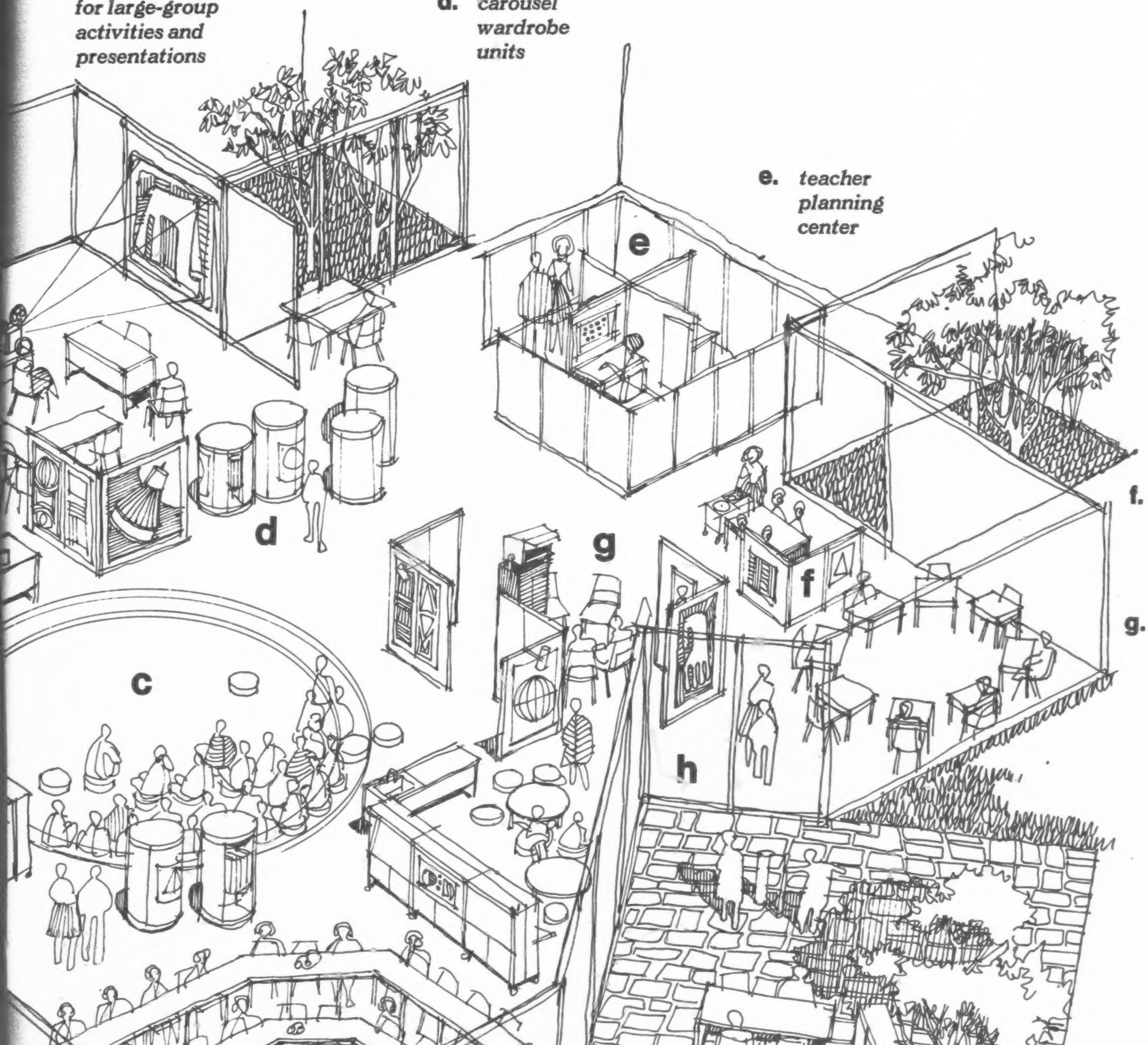
tpc *teacher planning center*



2 *operable partitions provide access to shaded central space*

3 *operable partitions between classrooms permit cooperative teaching*

4 *no fixed walls no operable partitions mobile storage units and screen walls define activity areas*



c. *central areas for large-group activities and presentations*

d. *carousel wardrobe units*

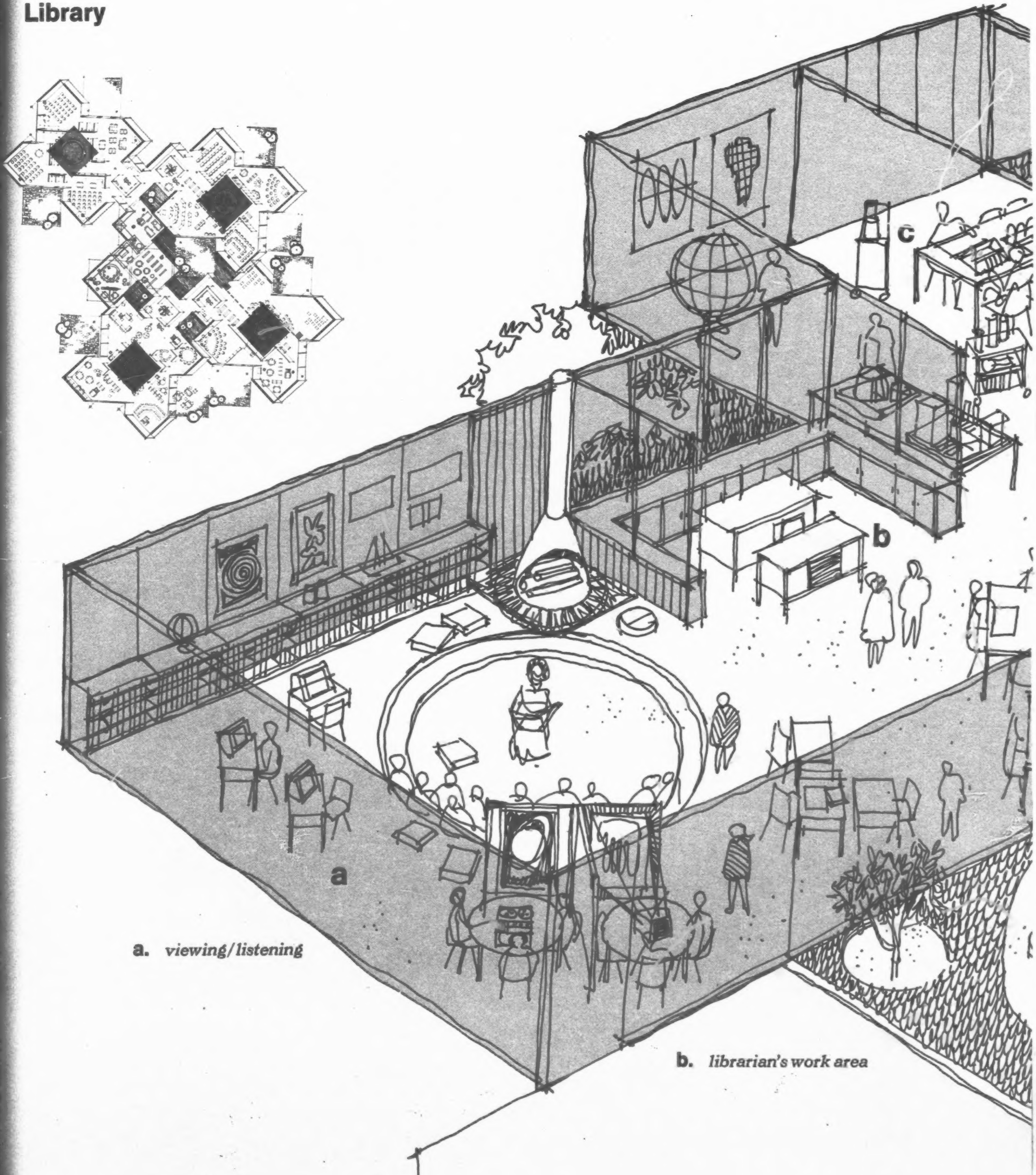
e. *teacher planning center*

f. *low screen wall define small-gro activity areas*

g. *project alcove*

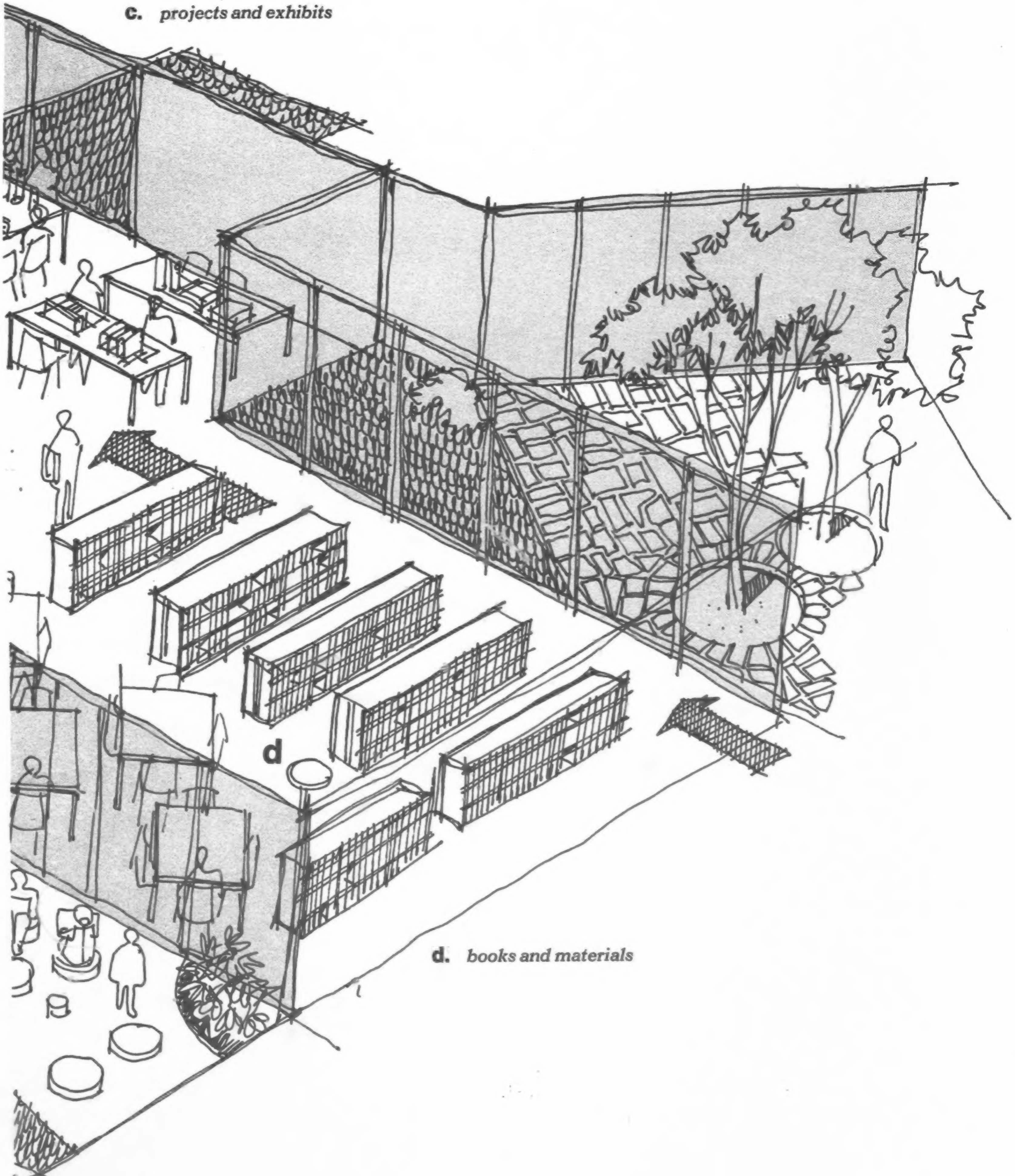
h. *access to outdoor learning areas*

Library



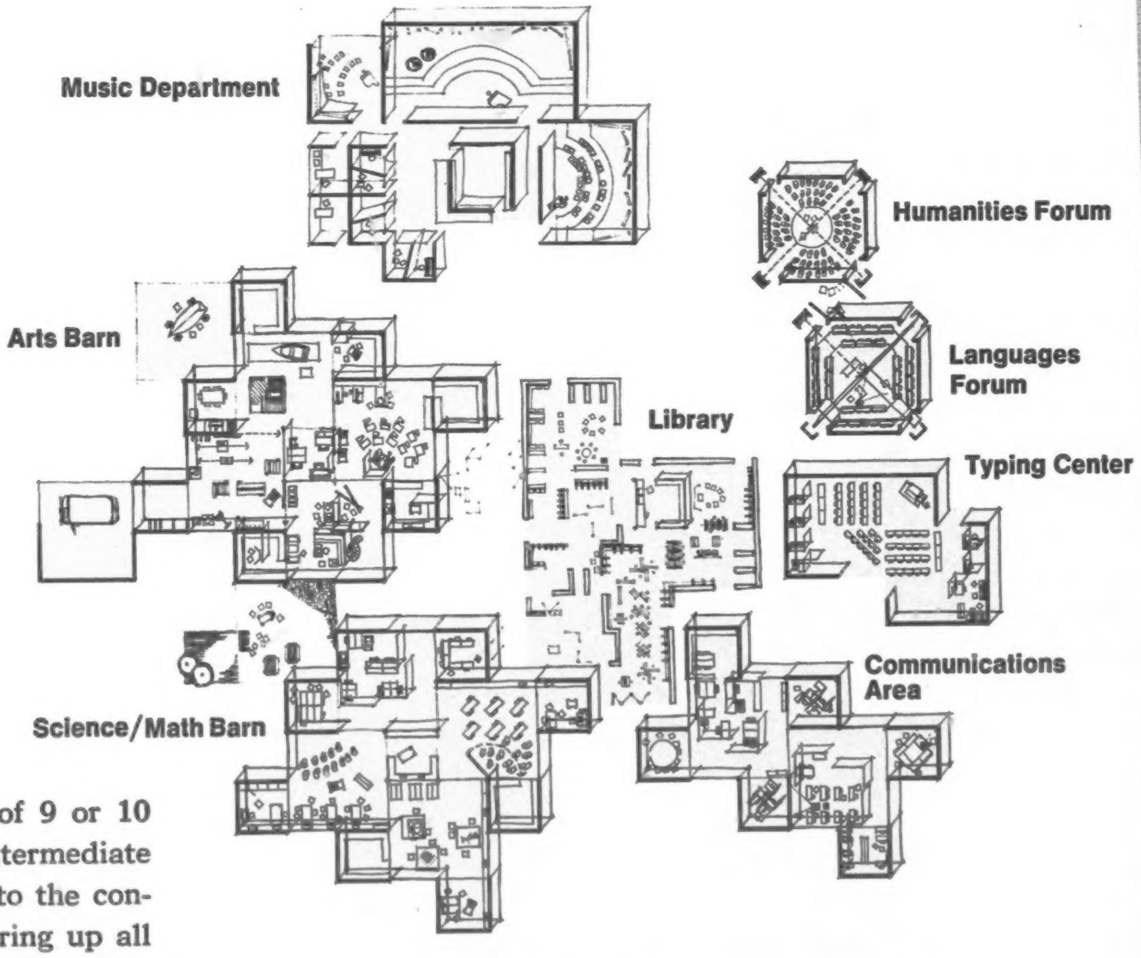
a. *viewing/listening*

b. *librarian's work area*



c. *projects and exhibits*

d. *books and materials*



THE MIDDLE SCHOOL

Children will progress around the age of 9 or 10 from the primary school to a middle or intermediate school. In the late 1960's this alternative to the conventional junior high was beginning to spring up all over the country, for a variety of reasons—social, educational, and sometimes just plain expedient.[1] A middle school, like the one pictured here, might cover three or four grades in the upper-elementary years, probably grades 5 or 6 through 8. Today's youngsters, it is generally agreed, mature earlier than their parents did. Long before they reach the teens, they seem to be ready for much richer and more concentrated school experiences than the traditional system provides. Ideally, the pre-teen-ager, after four or five years in school, should have a fair mastery of the basic skills and be expected to apply them to progressively challenging and substantial problems.

The drawing suggests in broad strokes an environment designed to meet the diverse needs and capacities of the intermediate-aged children. It offers a marked change of pace and sophistication from the primary school; yet it is radically different from the rigid departmentalization of the conventional junior high, which all too often has simply exposed the young teen-ager to a watered-down version of high school. In the scheme shown here, and enlarged on the following two pages, the school introduces the child to departmentalization by grouping together the facilities for related disciplines, in large, open, barnlike areas. Central to the whole design, in fact and in spirit, is the library (or learning-resource center) where each child may be assigned a carrel and storage space. The middle-schooler, as his powers and confidence increase, makes greater and greater independent use of the library and its varied resources.

The drawing shows, in the upper lefthand corner, an arts barn that provides for creative art, industrial art, and the domestic arts. One area flows into the next, with a minimum of dividing walls. The central workspace is for the teachers. Only the noisy power tools are set off by themselves; the little rooms around the barn's perimeter are primarily for storage, with space enough for small groups of students to work on plans or actual projects. The large drawings on pages 60 and 61 show the arts barn in greater detail. The central concept is the unity of the creative and practical arts. The design minimizes conventional divisions, including the fusty split between the vocational and creative. In the same spirit it seeks to eradicate the old opposition between artsy-craftsy girl work and rugged manual boy work. A middle school that opened three years ago in Amory, Mississippi, has just such an open art, shop, and home-arts area.

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[1] See "Middle Schools," EFL, 1965.

Going down the page from the arts barn, there is another barn labeled "Science and Math." Here again the intent is to bring together physically disciplines that are intellectually related. The plan shows three laboratory spaces clustered around a storage and preparation room; adjacent to it is a planning center for a team of eight teachers—the combined staff of the science and mathematics departments. Flanking the center are small seminar rooms. Each of these three laboratories can be used for science or mathematics. The design presumes there are no arbitrary divisions between these subjects or spaces; groups can flow from one lab to another depending on the numbers of students and the kinds of interdisciplinary projects on hand. The key to these laboratories is mobility and flexibility. All furniture and equipment, except for the fixed plumbing counters, is movable.

The small spaces abutting from the laboratories are for students working on advanced, long-range projects. The one adjoining the laboratory to the left contains cages for animals and all requisite facilities for "plug in" lab work. The space next to the laboratory on the right contains computation devices and other data-processing equipment. The space off the combined central lab at the bottom of the drawing can be reserved for students working on geometric/chemical models.

Counterclockwise to the next cluster, the scheme shows a communications barn; English, foreign languages, reading, and speech. Central spaces are rimmed by small special-purpose rooms—for listening, for conferring, for testing, for seminars, and for recording. Nearby is an area for instruction in typing—an almost essential skill (for which preadolescents show a special aptitude), which is easy to learn with a minimum of formal instruction. The typing room is especially equipped with audio-visual aids for instruction with large groups. The room is augmented with small booths where students can work in comparatively isolated surroundings on assigned papers.

In the upper right-hand corner of the diagram are two areas labeled "Humanities Forum" and "Languages Forum." These are highly flexible spaces to provide instruction for groups of different sizes. The arena for languages is step-tiered and wired for sound to each student station. Operable partitions make possible four separate sections for 14 students each. Mobile control consoles can be plugged in at the front of each quarter section. With all partitions retracted, the large space doubles as a place for debate or a lecture room. The humanities forum is likewise divisible by four. Thrown open, it constitutes a small theater-in-the-round or conference center. Its utility is enhanced by seats that pivot in a complete circle, so that each quarter-section can turn itself into a buzz session after the group as a whole has received a presentation.

The library-resource center is the heart of the building, physically and philosophically. It is situated so that students naturally pass through it many times a day, entering, leaving, or moving around the school. Readily accessible books, magazines, and audio-visual and electronic resources, dictionaries in which to look up words that have just come up in class, visual displays—everything the library has to offer should be represented out in the open, inviting students to partake at any time, all the time. It is an intellectual supermarket.

Note the diverse furnishings including carrels which students can use as their independent study HQ.

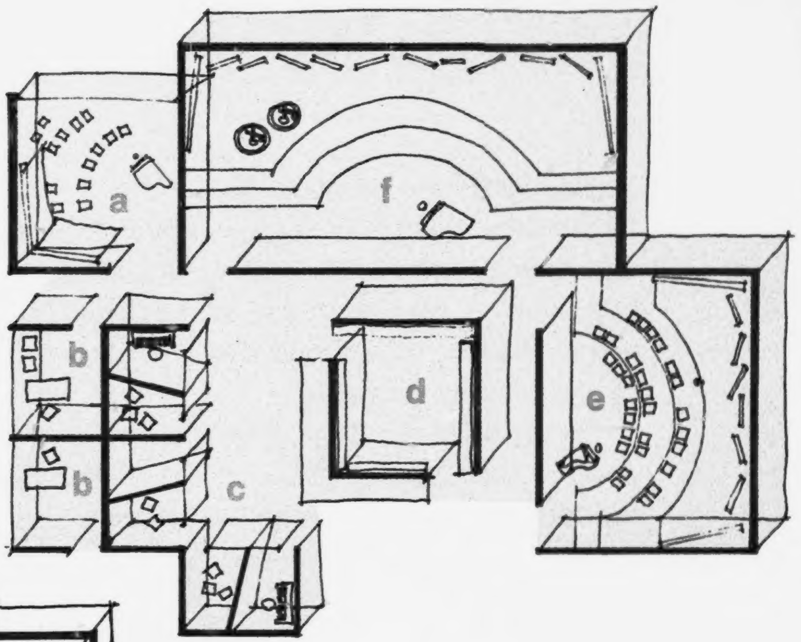
A living room or study atmosphere is achieved in the library through the use of informal and comfortable materials and fabrics on walls and floors, deployment of lounge chairs and work tables in open arrangements and variety in atmosphere.

Display space in the library is used to help make the school a nexus of the best works of other men's minds and hands as well as projects by the school's students.

Live television coverage of momentous events can be turned into potent instruction if auxiliary means are used to get the fullest meaning out of the experience. The school shouldn't be a place cut off from the events in the outside world; it should be electronically plugged into the world community.

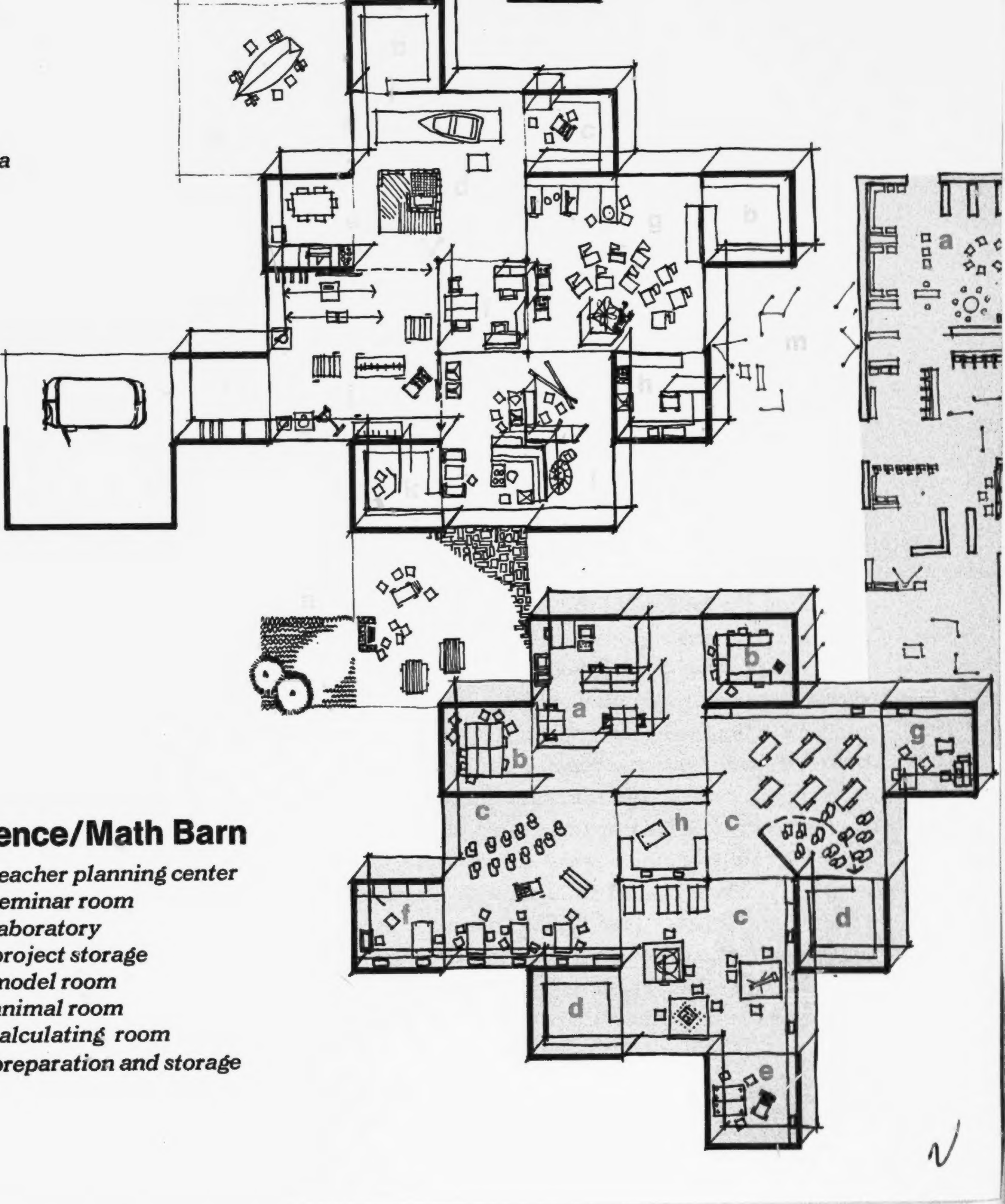
Music Department

- **a.** *ensemble room*
- **b.** *office*
- **c.** *practice rooms*
- **d.** *instruments and storage*
- **e.** *choral room*
- **f.** *instrumental room*



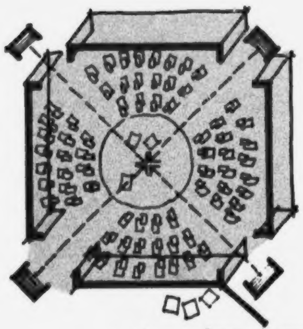
Arts Barn

- **a.** *outdoor construction area*
- **b.** *project storage*
- **c.** *finishing room*
- **d.** *industrial arts*
- **e.** *planning room*
- **f.** *teacher's work area*
- **g.** *creative arts*
- **h.** *dark room*
- **i.** *receiving room*
- **j.** *power tools*
- **k.** *fitting room*
- **l.** *domestic arts*
- **m.** *exhibits*
- **n.** *outdoor cooking area*

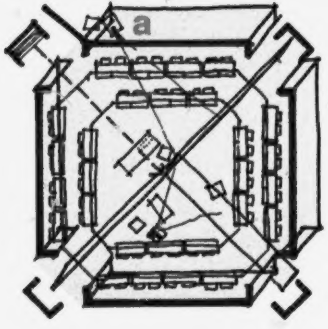


Science/Math Barn

- **a.** *teacher planning center*
- **b.** *seminar room*
- **c.** *laboratory*
- **d.** *project storage*
- **e.** *model room*
- **f.** *animal room*
- **g.** *calculating room*
- **h.** *preparation and storage*



Humanities Forum

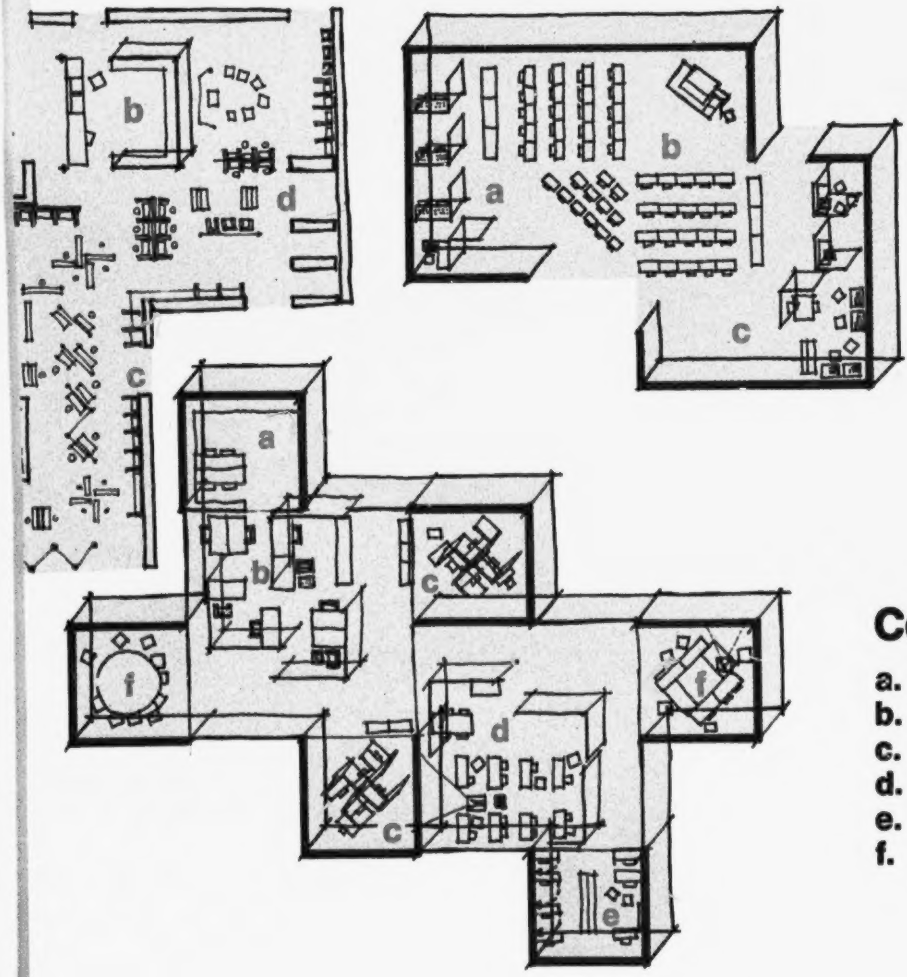


Languages Forum

a. *projection and control booth*

Library

a. *study lounge*
b. *control*
c. *study carrels*
d. *a-v listening and viewing*



Typing Center

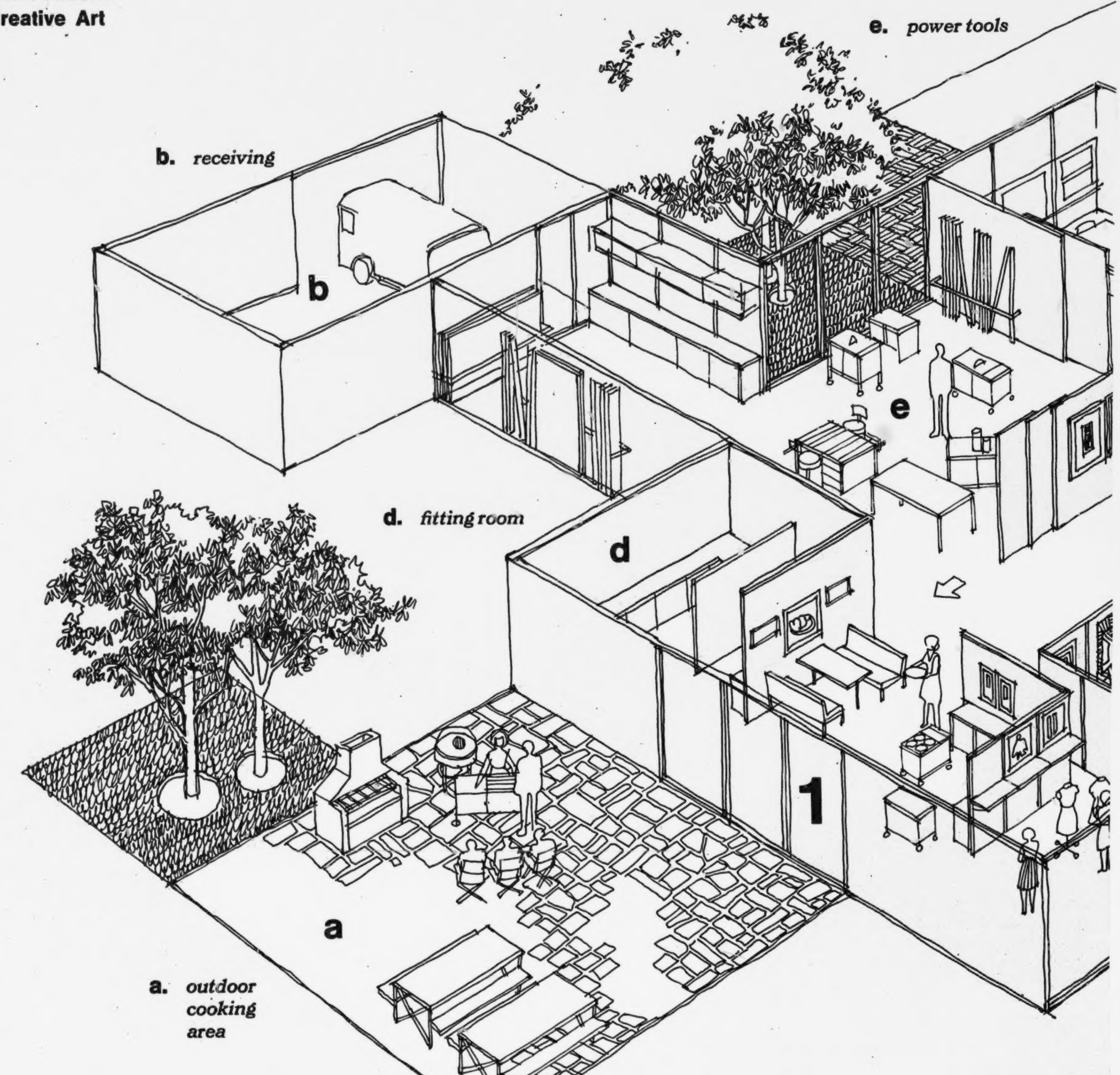
a. *typing booths*
b. *presentation area*
c. *communications media projects*

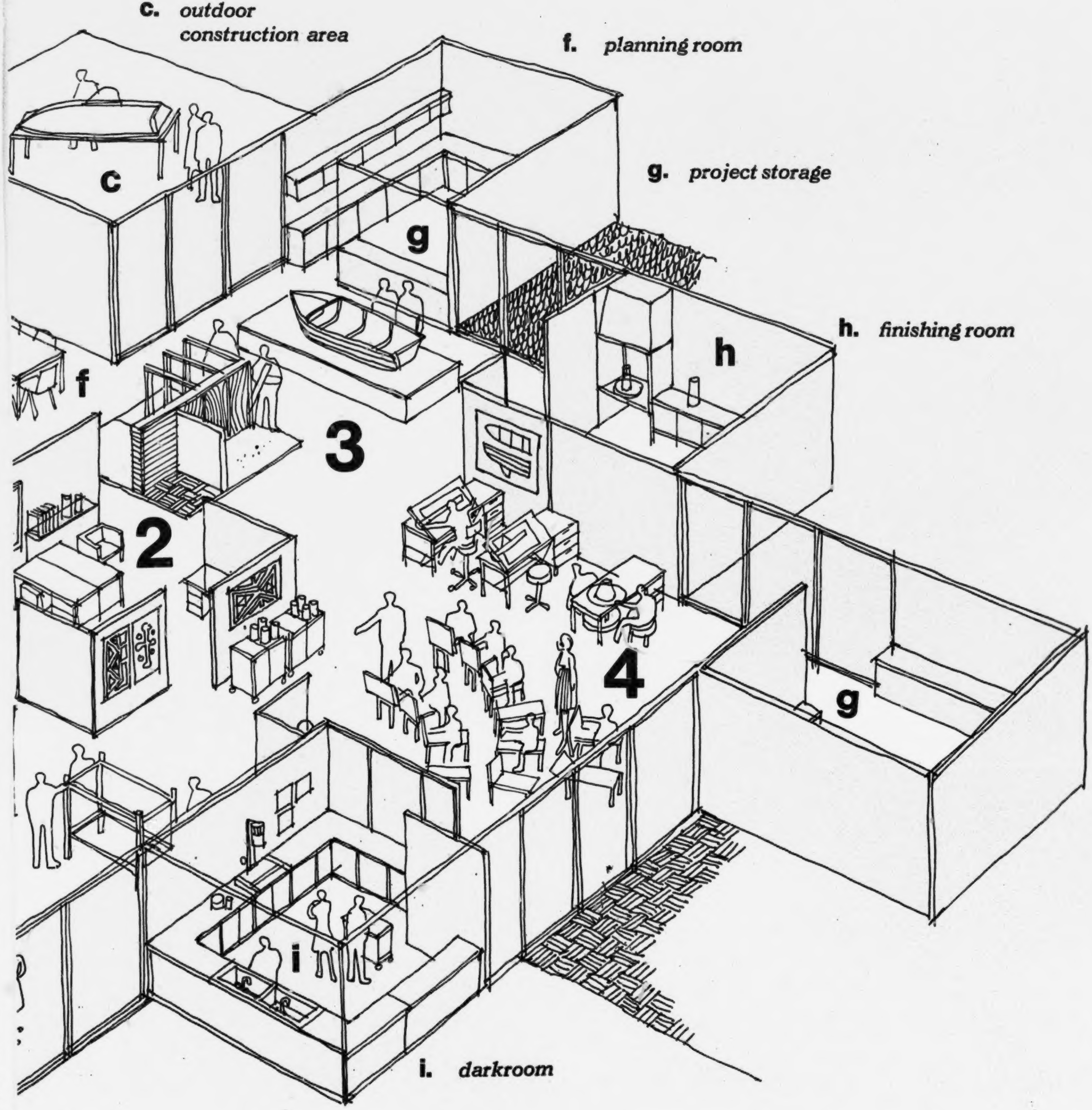
Communications Area

a. *recording studio*
b. *teacher planning center*
c. *a-v carrels*
d. *language laboratory*
e. *student project area*
f. *seminar room*

Arts Barn

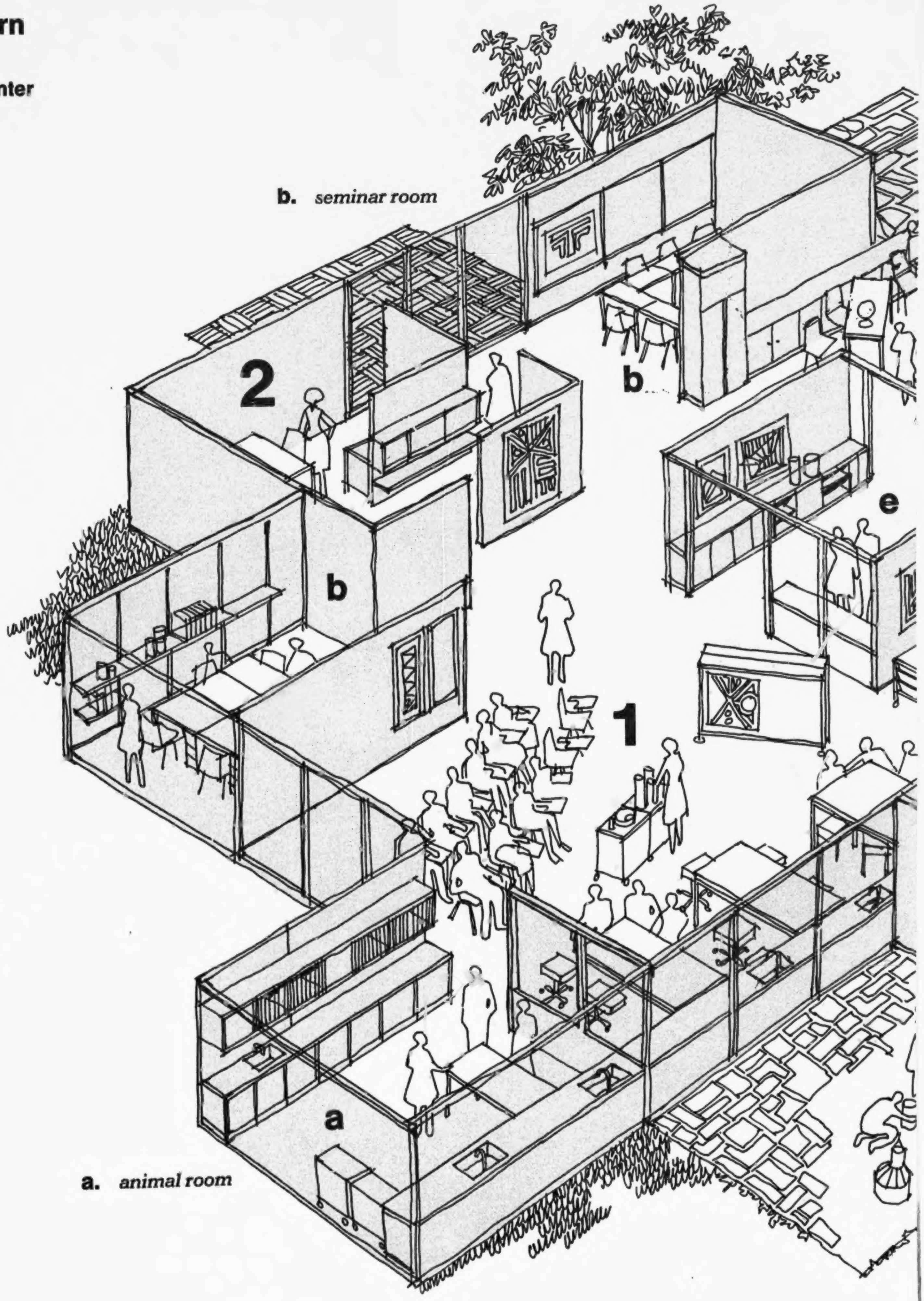
1 Domestic Arts
2 Teacher Work Area
3 Industrial Art
4 Creative Art

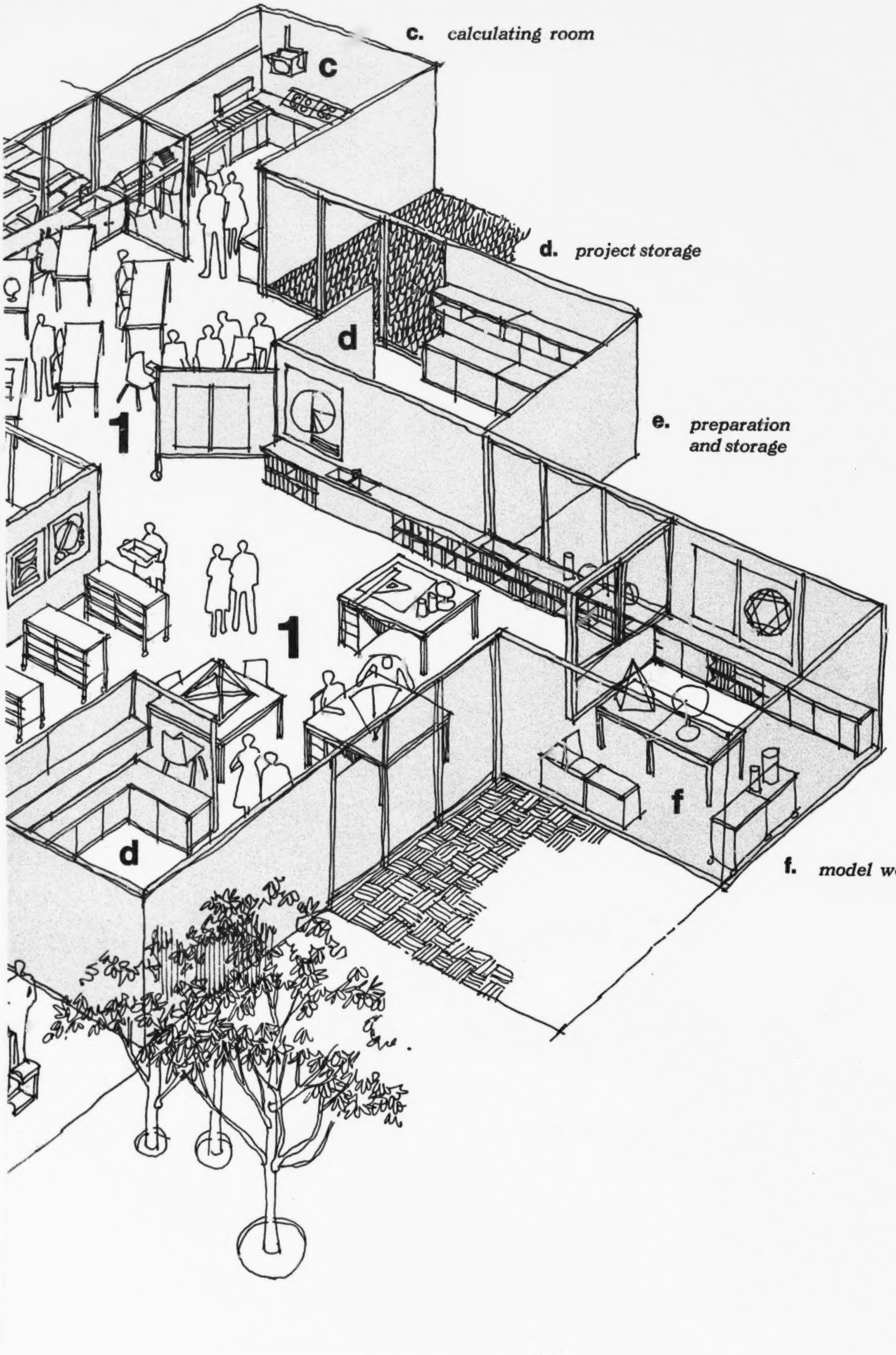

e. power tools
b. receiving
b
e
d. fitting room
d
1
a
a. outdoor cooking area


c. outdoor construction area
f. planning room
g. project storage
h. finishing room
i. darkroom
c
g
f
h
3
2
4
g
i

Science/Math Barn

1 Laboratory
2 Teacher Planning Center


b. seminar room
2
b
b
e
1
a
a. animal room



c. *calculating room*

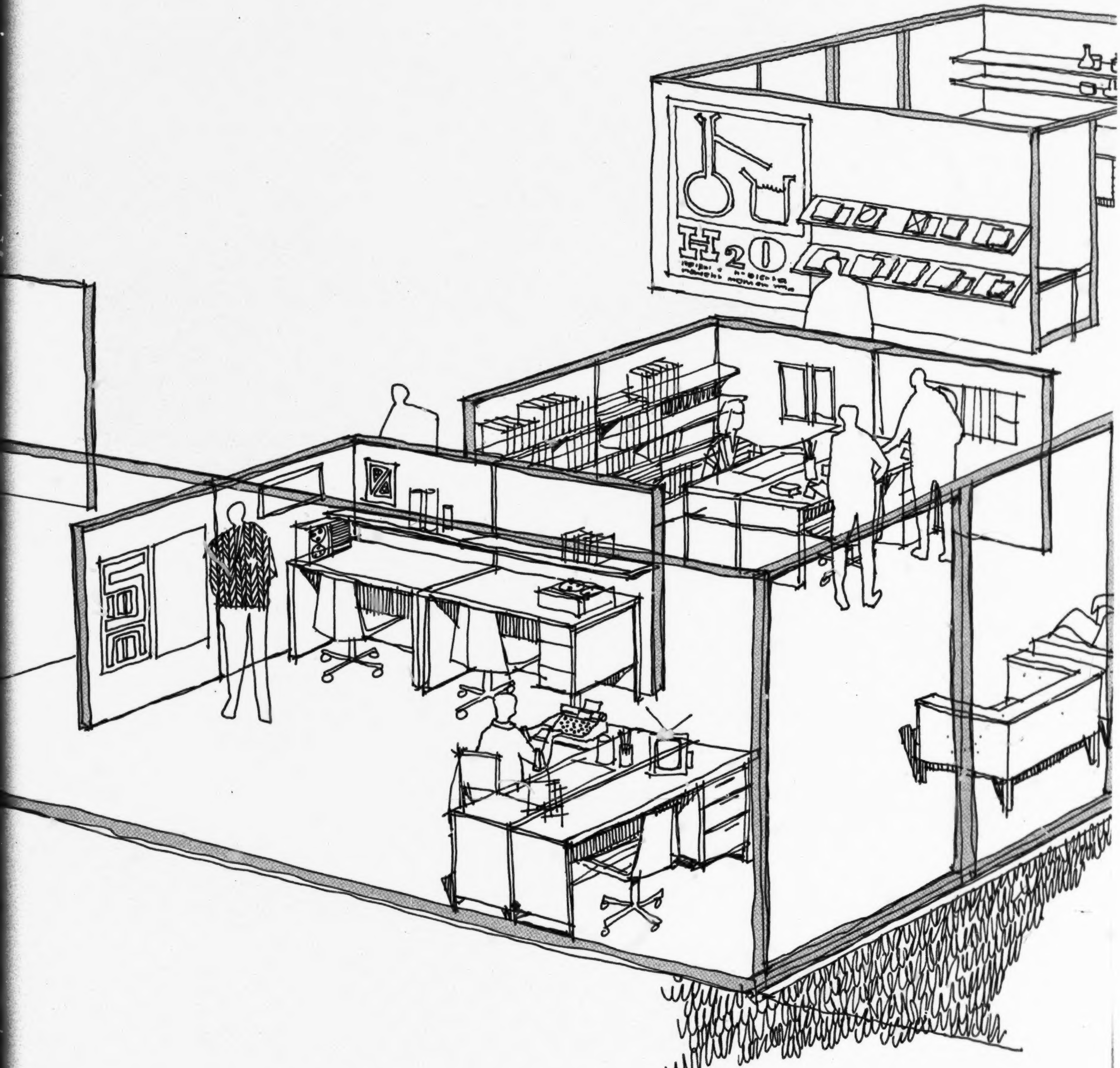
d. *project storage*

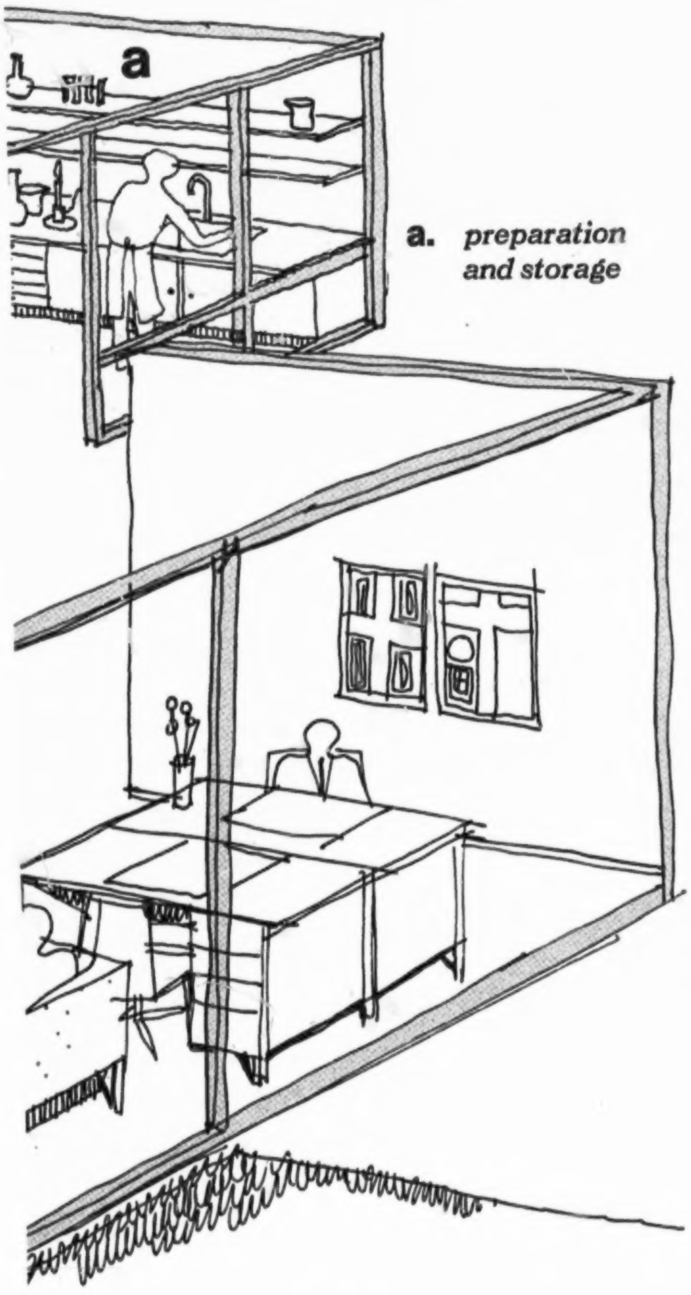
e. *preparation and storage*

f. *model work room*

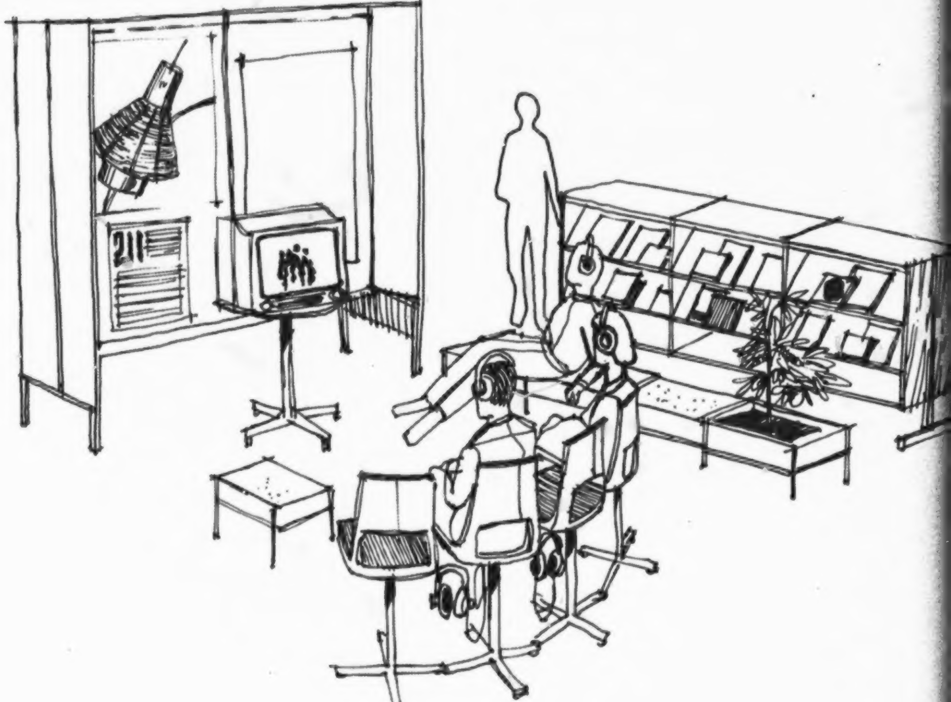
Science/Math Barn

Teacher Planning Center



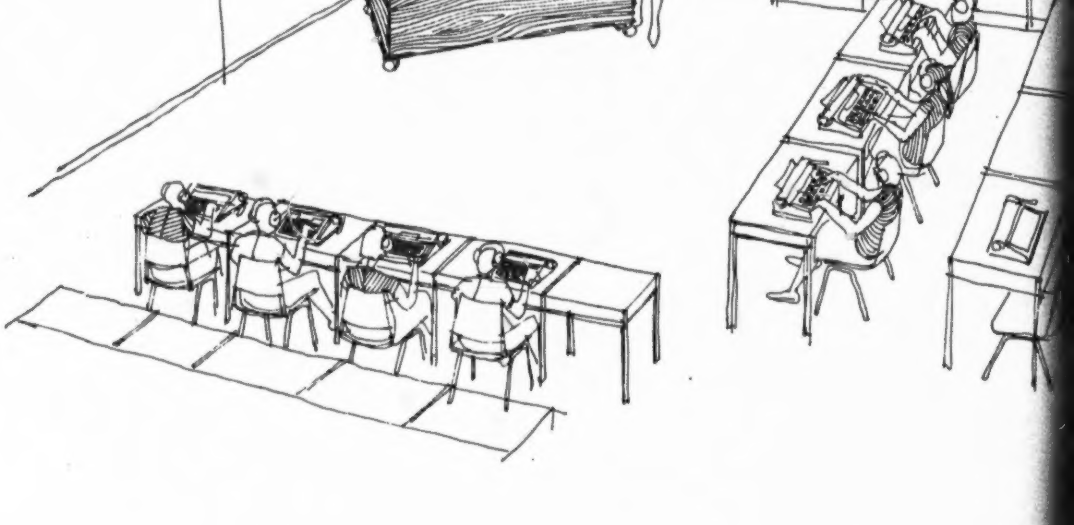


a. *preparation and storage*

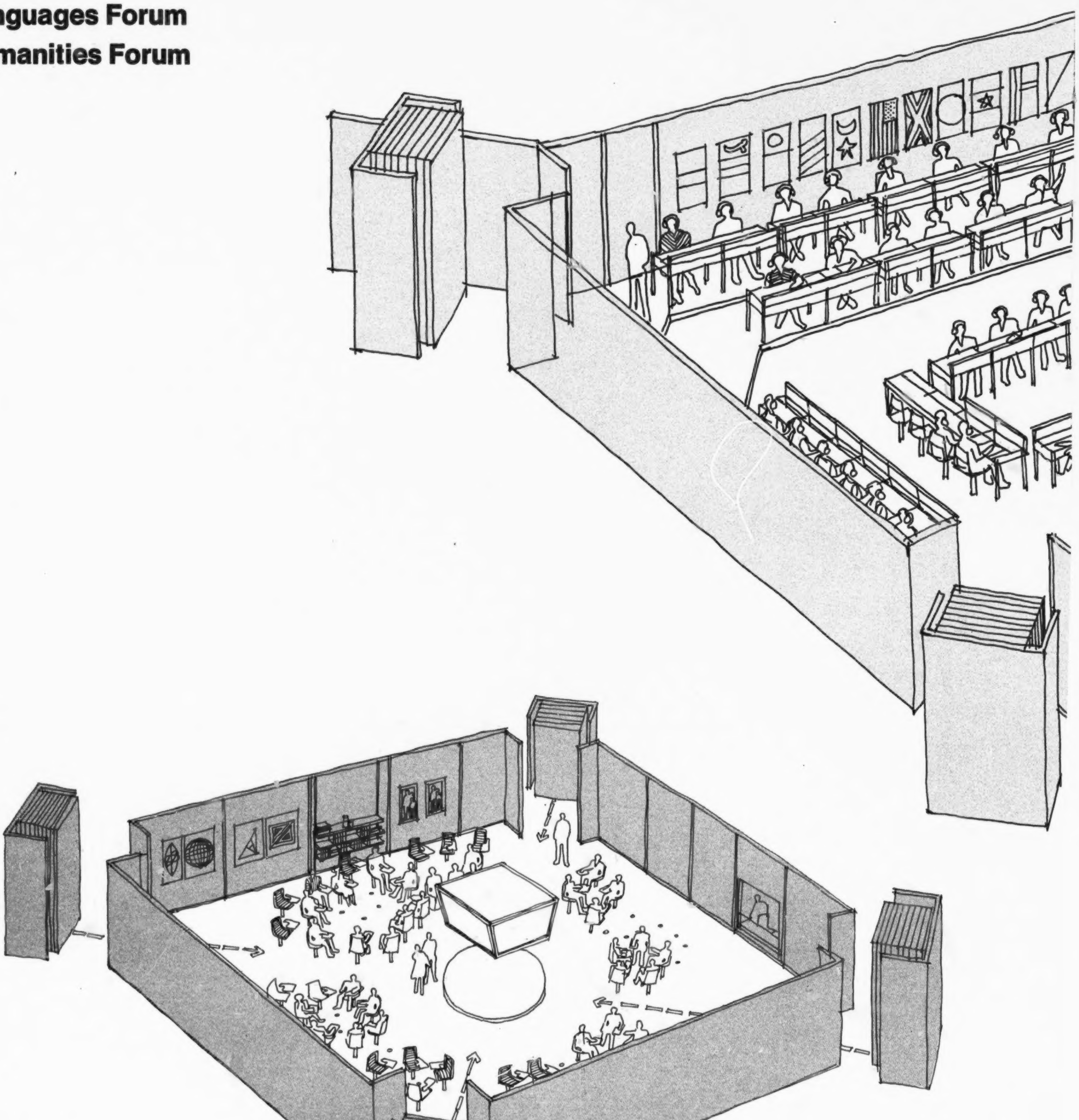


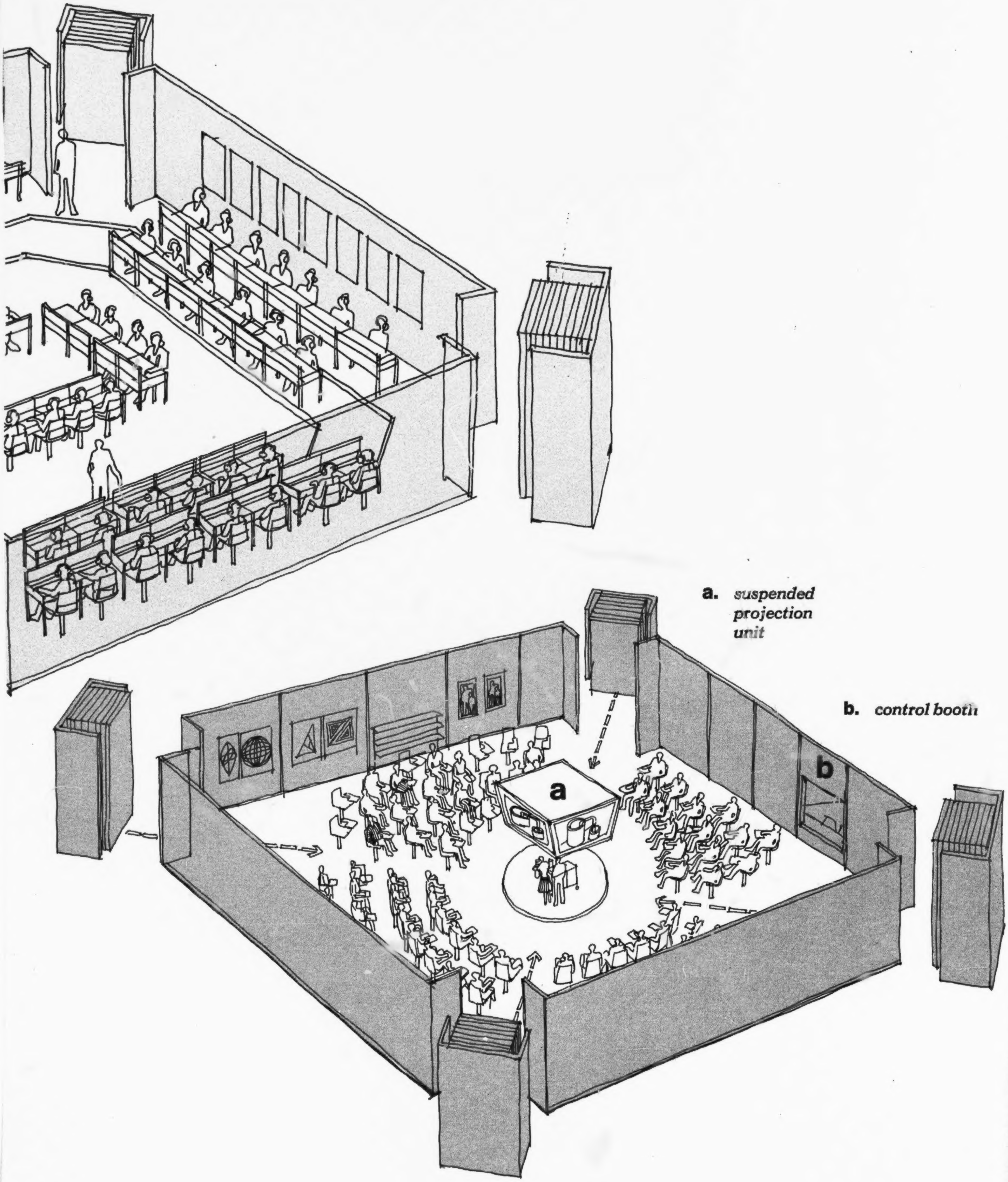
Library *a-v listening and viewing*

Typing Center *presentation area*



Languages Forum
Humanities Forum





a. *suspended projection unit*

b. *control booth*

THE SECONDARY SCHOOL

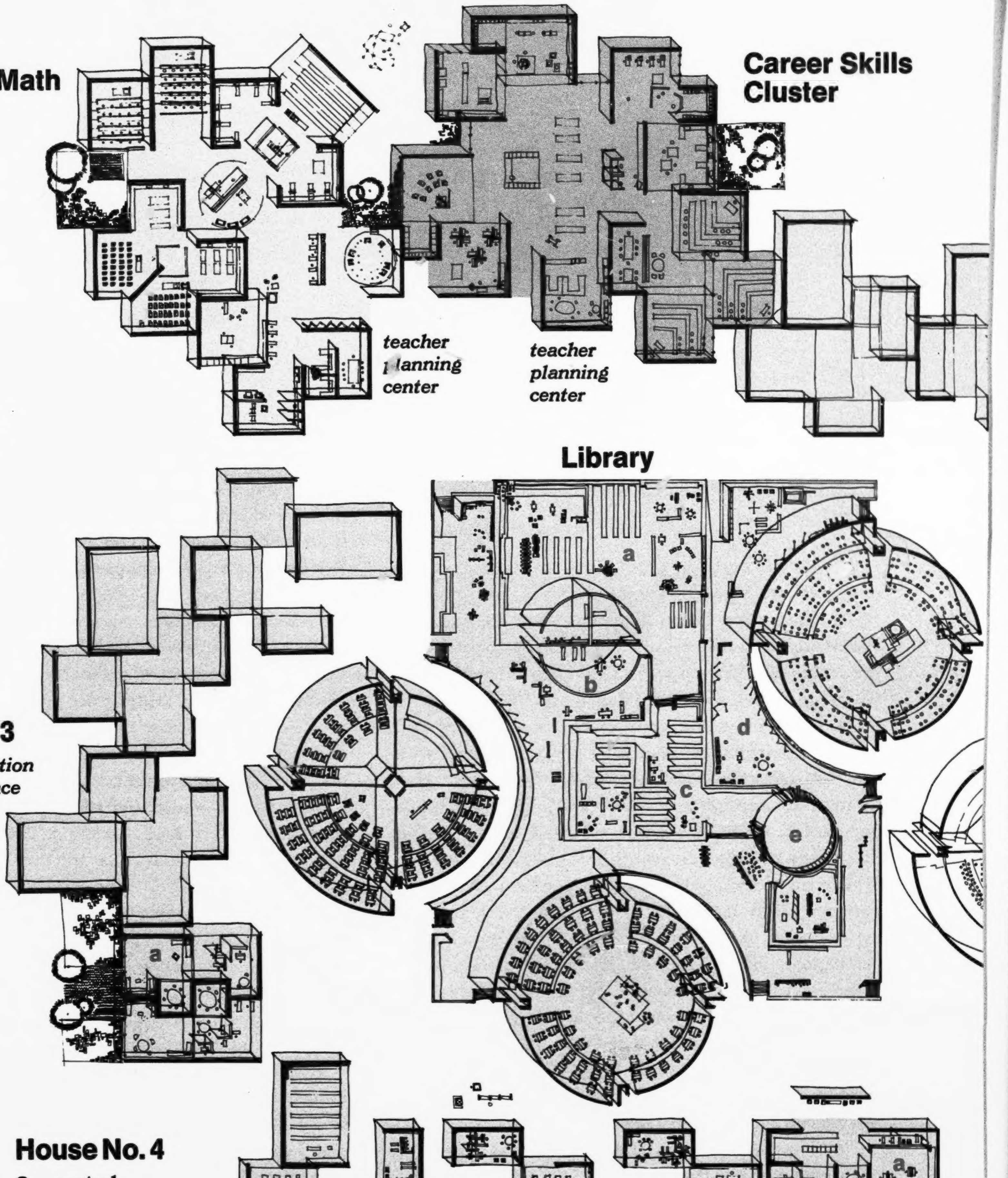
The American high school faces major problems—of curriculum, organization, and logistics—growing out of its diverse functions, changing demands, and new relationships to the rest of the educational system. As the result of efforts to make secondary education virtually universal, the high schools are enrolling many more students—some with severe deprivations and awesome learning problems. At the same time, with the vast expansion in college-going, they must serve more and more students who take higher education for granted. And as academic standards have stiffened during the past decade, and the size of institutions has grown, high schools increasingly conform to the departmentalization which characterizes collegiate education—with the inevitable fragmentation of student, curriculum, and school. Finally, social pressures demand a truly comprehensive high school, prepared to meet all comers. Visits to schools and conversations with conscientious and harried educators reveal the tensions which cause many high schools virtually to shudder under the strain of trying to meet these compelling and competing demands.

The comprehensive high school suggested here seeks to resolve some of these tensions in a productive synthesis. It is designed for about 2,000 students, big enough to provide the expensive facilities and the scarce talents needed for a solid program of studies, but arranged to counteract the disadvantages of bigness. Serving diverse social and scholastic needs—from advanced calculus to household management—the organization and physical plan of the school are intended to discourage academic and social separateness and snobbishness.

The school is divided into four 500-student "houses" to give each student and faculty member a sense of community and identity. Each house is composed of a vertical cross section of the student body, from first through last year, and represents a full range of ability, achievement, and aspiration.

But the key purpose of the plan is social and psychological, rather than academic. The idea is for each house to develop its own personality and atmosphere, in order to strengthen social relationships, emphasize activities on a human scale, encourage a sense of identity and the kind of group loyalty that helps children toward achievement and success. Now that competition is no longer a swearword in the best academic circles, there could be healthy inter-house contests in sports and in intellectual and co-curricular pursuits.

For the more specialized subjects, many of which require elaborate equipment and teacher specialists—science, mathematics, physical education, and the various fields of active creation and production—all students would make use of the same centralized facility. The library-learning center and the over-all school administration would also occupy central quarters and separate facilities.


Science/Math Cluster
Career Skills Cluster
teacher planning center
teacher planning center
Library
a
b
c
d
e
a
a

Library

- **a.** *electronic resources*
- **b.** *library control center*
- **c.** *reading resources*
- **d.** *display terrace*
- **e.** *special studies forum*

House No. 3

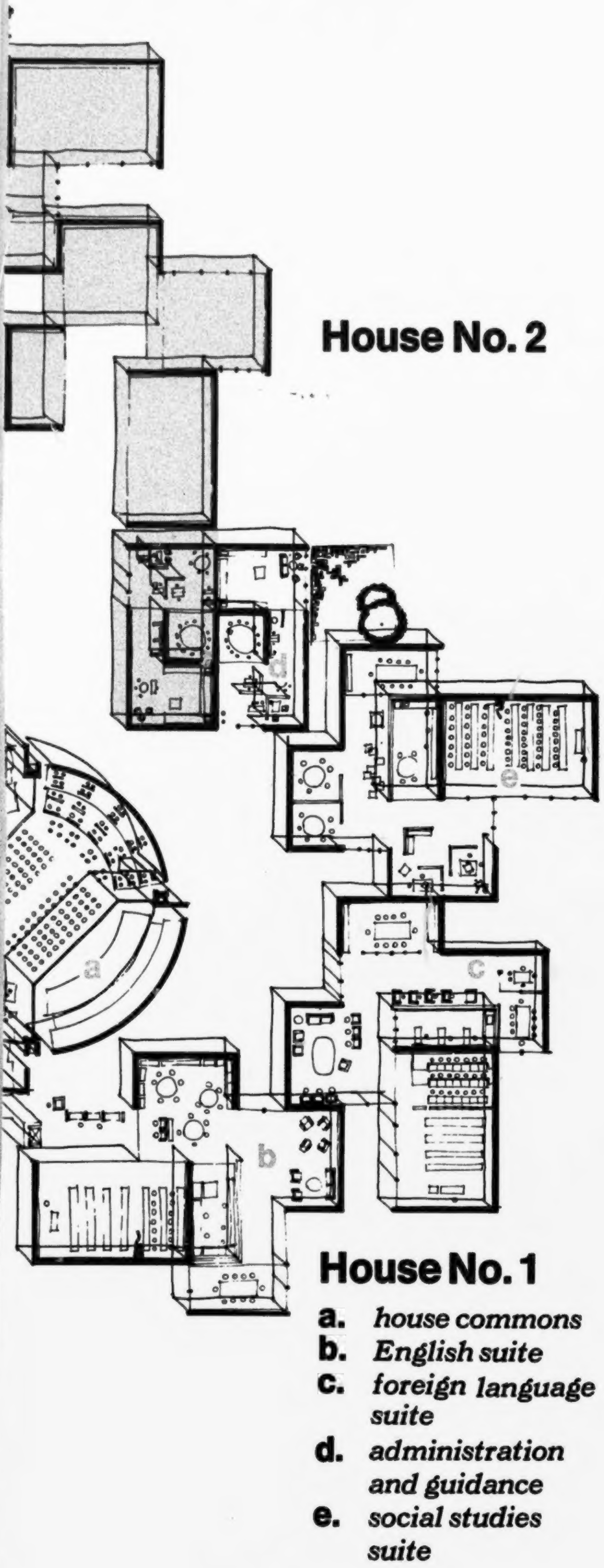
- **a.** *administration and guidance*

House No. 4

- **a.** *central school administration*

Here is a schematic plan of the entire space. While the facilities could be spread out this way if the school were built in the suburbs, they need not be: the houses and other buildings could occupy separate floors of a city skyscraper, for example. The important point is to preserve the indicated relationships: the physical separateness and unity of each of the houses, the central position of the library and of the top administrative cadre, the accessibility of the specialized facilities for science-math and career skills that serve the entire student body. One of the houses is shown arranged in conventional self-contained classrooms, while the others show the same space disposed for optimum use of flexible groupings and scheduling, team teaching and audio-visual devices. The school is designed to permit evolution in educational techniques to accommodate the variety of instruction it will have to house through its lifetime. The administrative offices for each house are contiguous with those of its neighbor —to encourage some jointly planned activities.

Perhaps the best existing model for the school conceived here is the "cluster college" concept being pioneered on the Santa Cruz campus of the University of California. Clark Kerr, former President of the University, sees this as the most promising antidote to the giantism that has been torturing the largest universities and is beginning to trouble secondary education. Another model is the comparatively ancient Oxford-Cambridge system of separate colleges, each with its own identity and esprit, which is represented in the United States in the Claremont colleges.



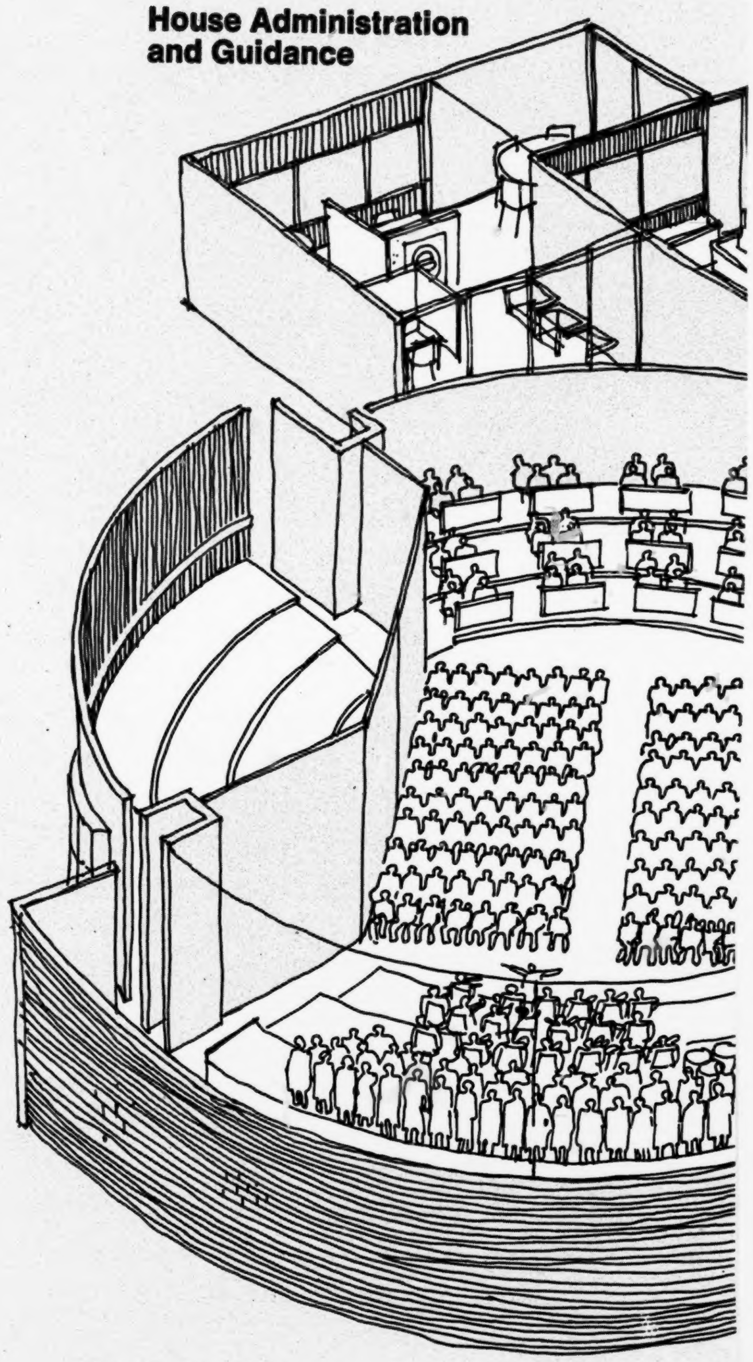
House No. 1

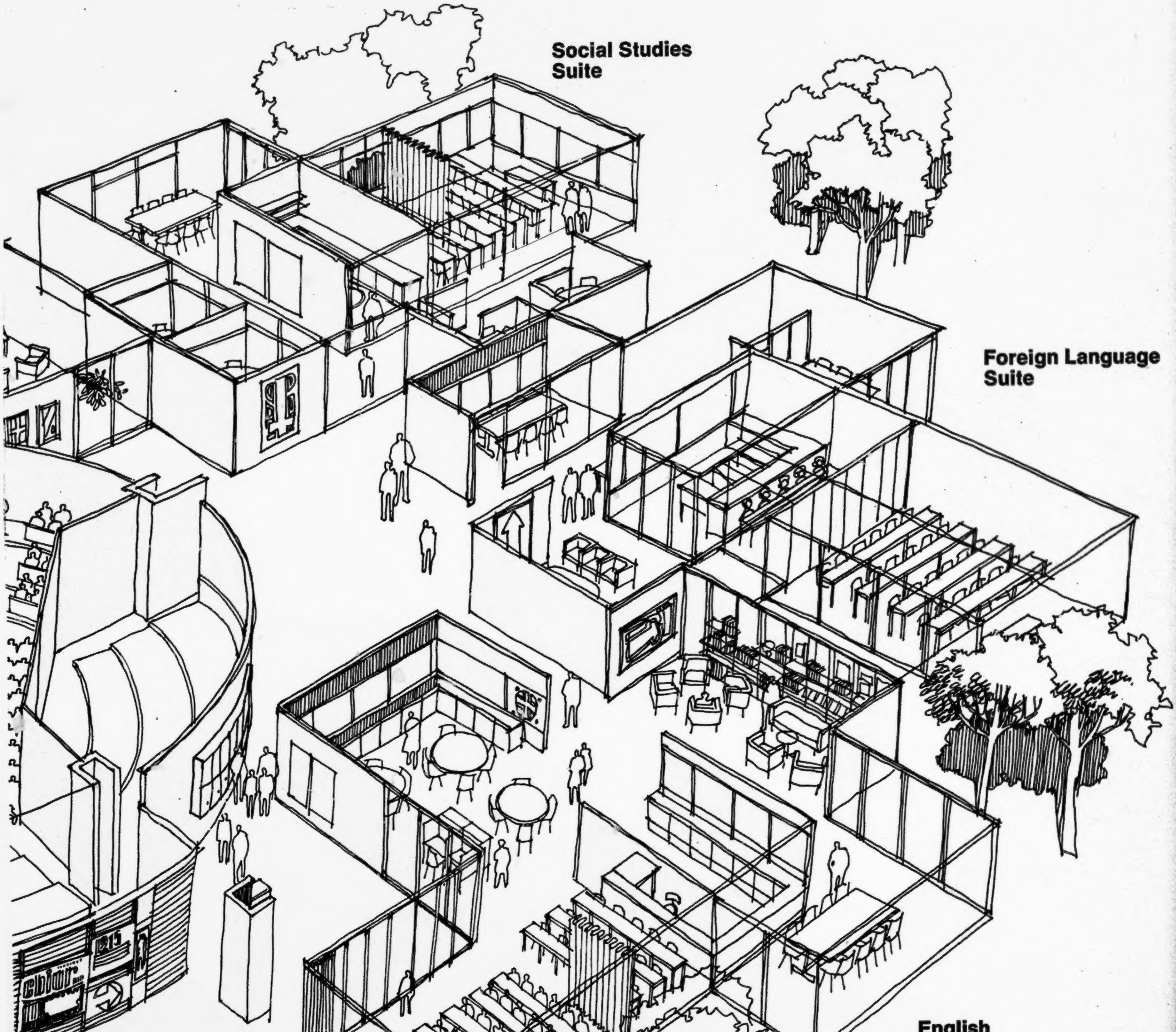
This drawing gives a more detailed picture of the basic design of one of the four houses. It consists of three subject-matter suites, each with its own cluster of teaching and study spaces, a section for central house administration and guidance staff, and the house commons, a focal point for all-house activities.

English, foreign languages, and social studies are taught within each house. In these subjects which require a minimum of special equipment, the house is largely autonomous and self-sufficient, with its own faculty as well as its own administrative and counseling staff. But there need be nothing rigid about this arrangement. Outstanding teachers or highly trained specialists move freely from house to house as needed, or interested students are brought together from various houses for live or televised instruction in seminar spaces provided in the library. A house might, as time goes by, acquire a particular academic flavor of its own—specializing perhaps in English or in advanced work in foreign languages or in history.

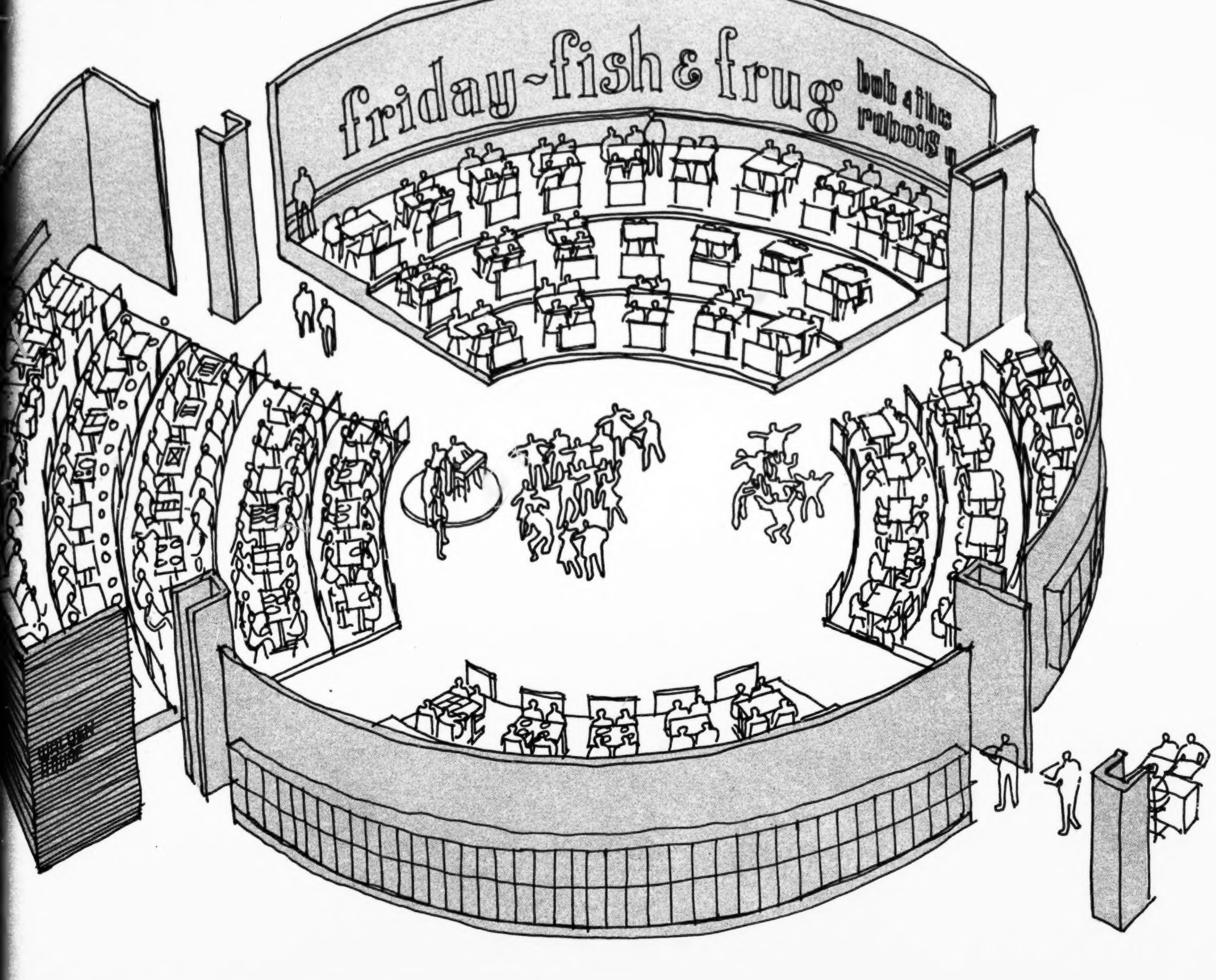
The House Commons, a space of many uses, is shown here with two of the wings shut off to create a long, rectangular nave, ideal both acoustically (because of the longer reverberation time) and visually, for a concert or choir performance.

This all-purpose space serves the functions of the conventional auditorium, but in a more amenable and flexible way than even the newer divisible auditoriums. Rather than building a 2,000-seat facility which would rarely be used to capacity and which is expensive both to build and maintain, this school uses the four commons rooms to serve almost all the functions of an auditorium, and more. For those rare occasions where all 2,000 students must be brought together physically (rather than being linked electronically), the school can use the gymnasium or rent a community facility such as a movie theater or convention hall for the day.



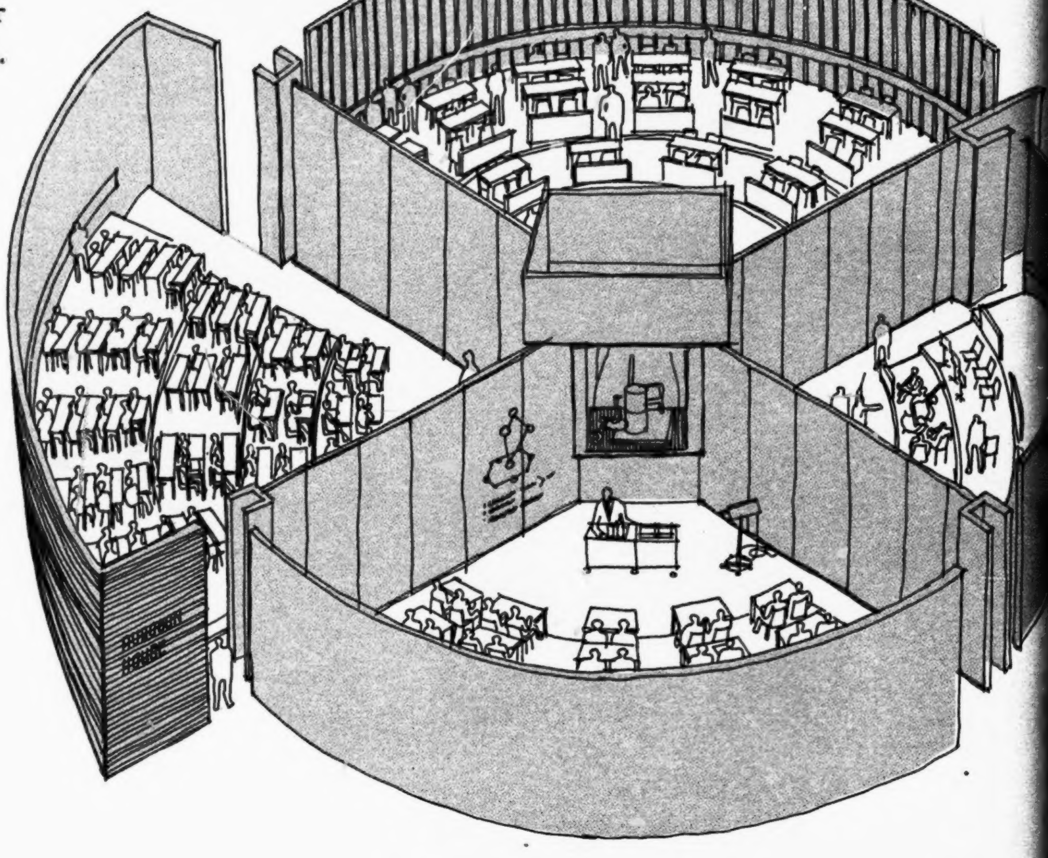

Social Studies Suite
Foreign Language Suite
English Suite
choir

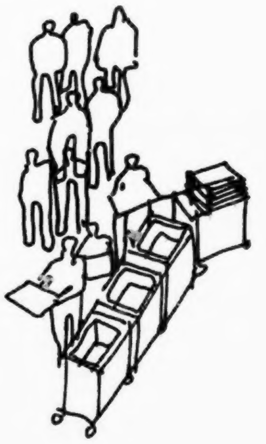
House Commons

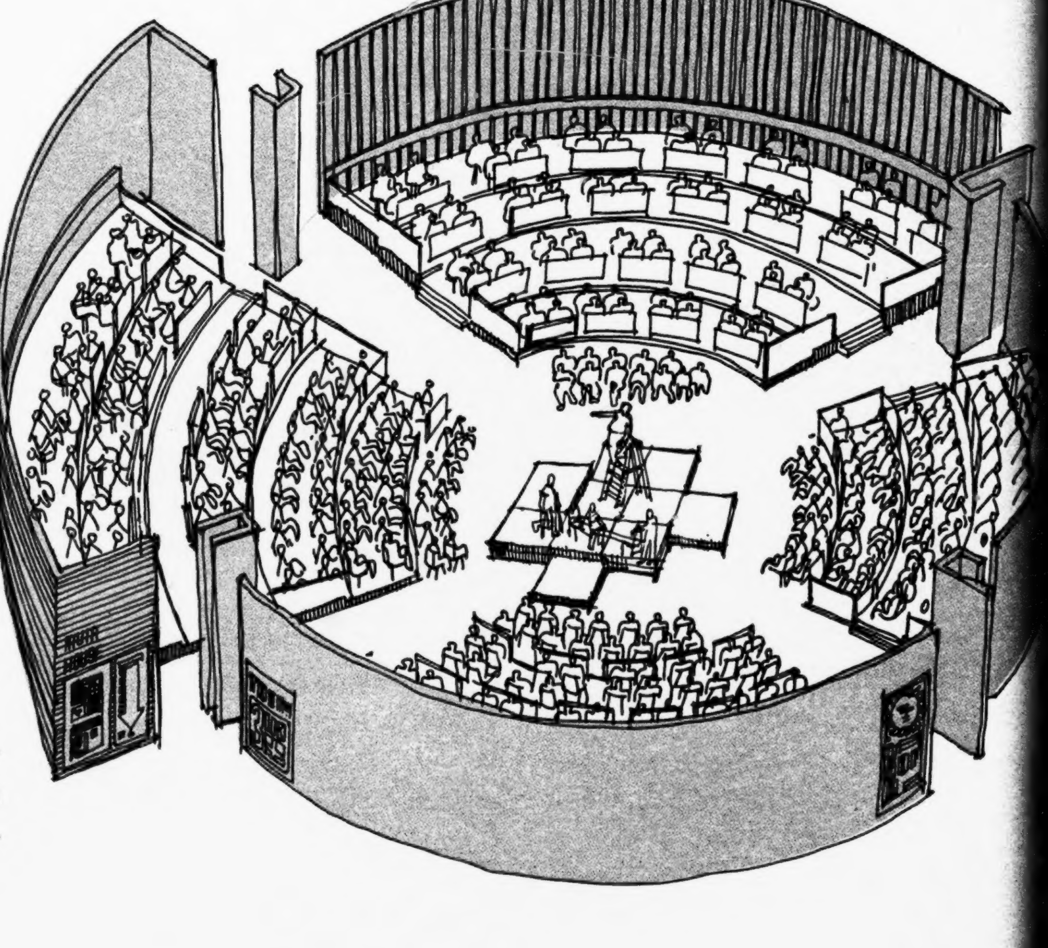


The commons area may be used for noonday dining, or, by modulating the lighting, for a social event: a pop concert, perhaps, or a teen cabaret. Two hundred students could sit at the small tables, thus the entire house could be accommodated with three sittings. The central space is clear for the musicians and dancers or for ping-pong, and the rear tiers are set aside for table games. Adroit use of flexible lighting, wall decorations, and other improvisations transform the commons atmosphere for special events.

Here the commons room is subdivided into large-group lecture-demonstration spaces. Note the rear screen projection equipment which can serve each area.



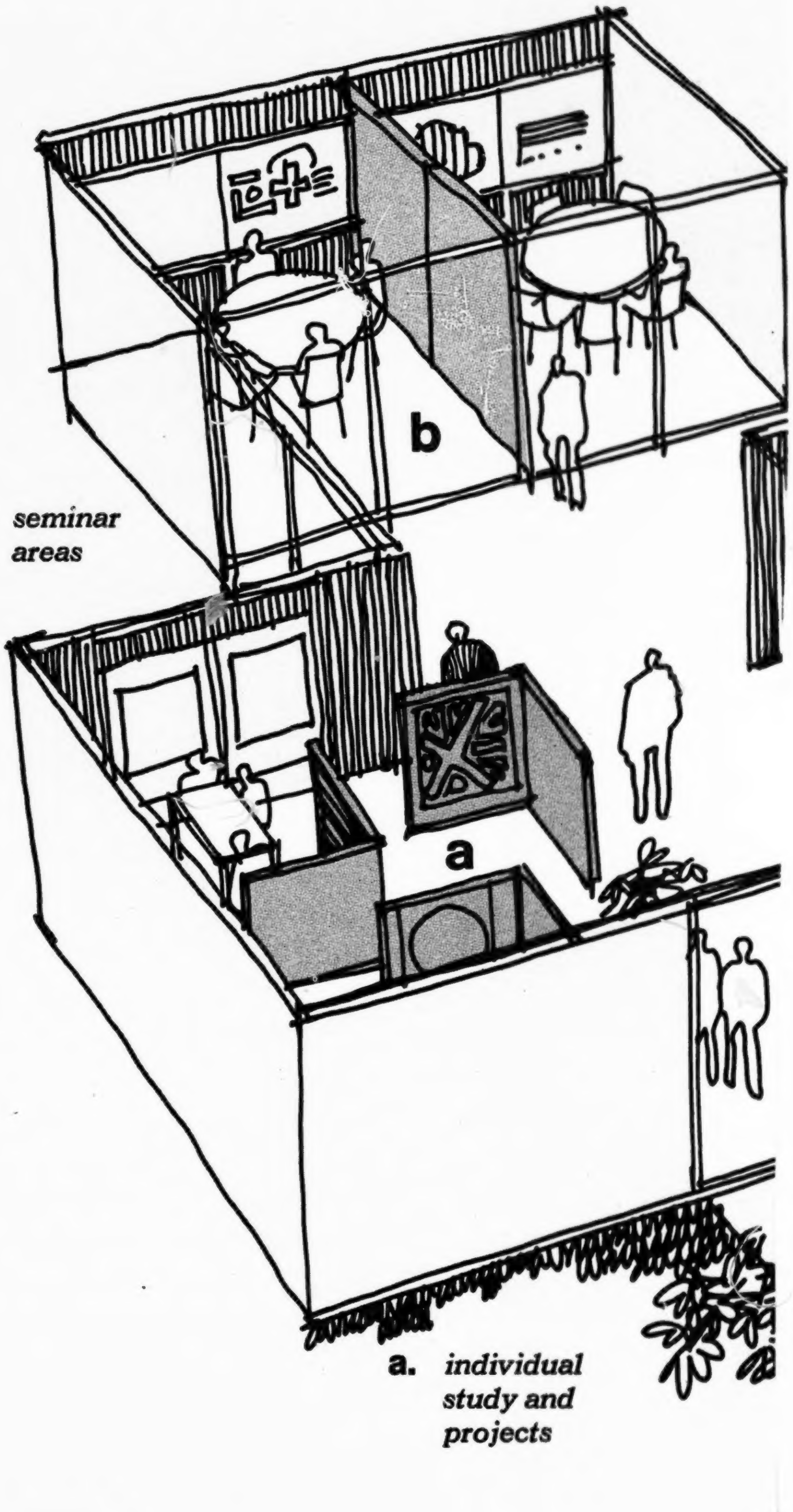




With all four partitions opened, the commons provides seating for the entire house and a central area for a house meeting, or as shown here, for theater-in-the-round.

Subject Matter Suite

□ *permanent partitions*
▨ *relocatable partitions*
▨ *folding operable partitions*
■ *skiddable-screen walls*

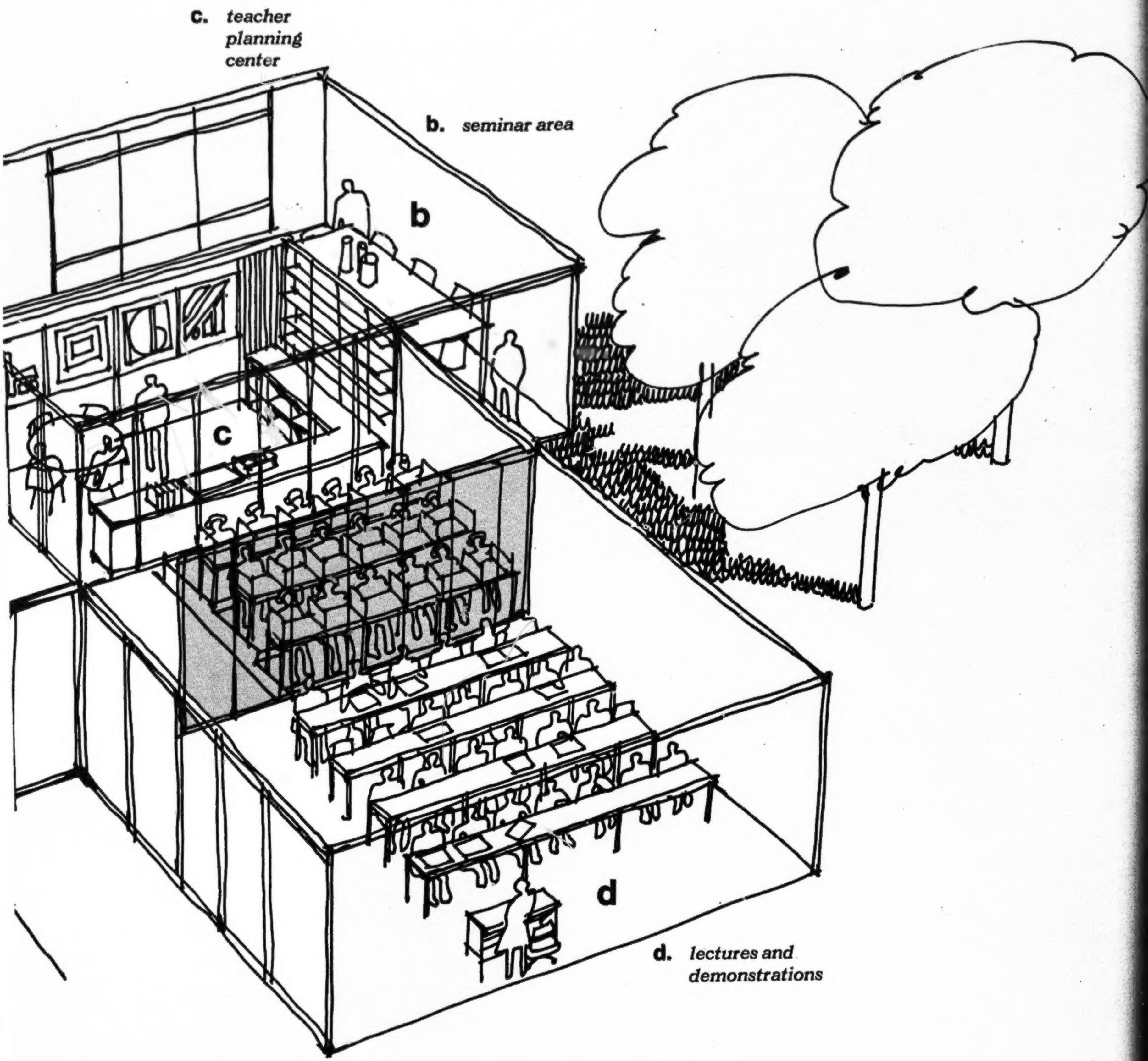


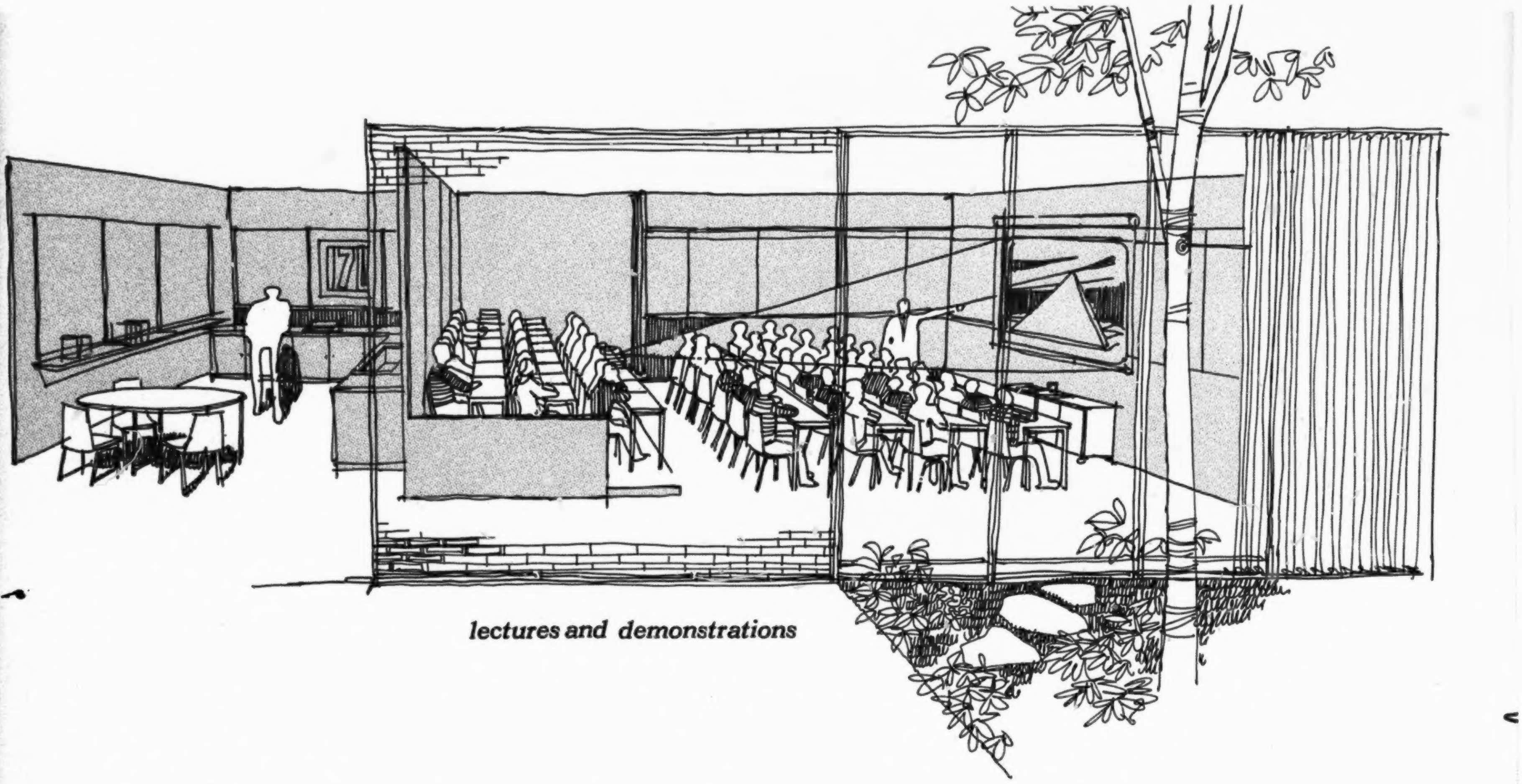
b. *seminar areas*

a. *individual study and projects*

The three subject-matter suites in each house consist mainly of instructional space, plus space for the teachers to plan, confer, and produce teaching materials. The entire area may be organized to provide appropriate places for seminars, for individual study or work on projects, and for lectures or demonstrations, with provision for electronic devices in each case.

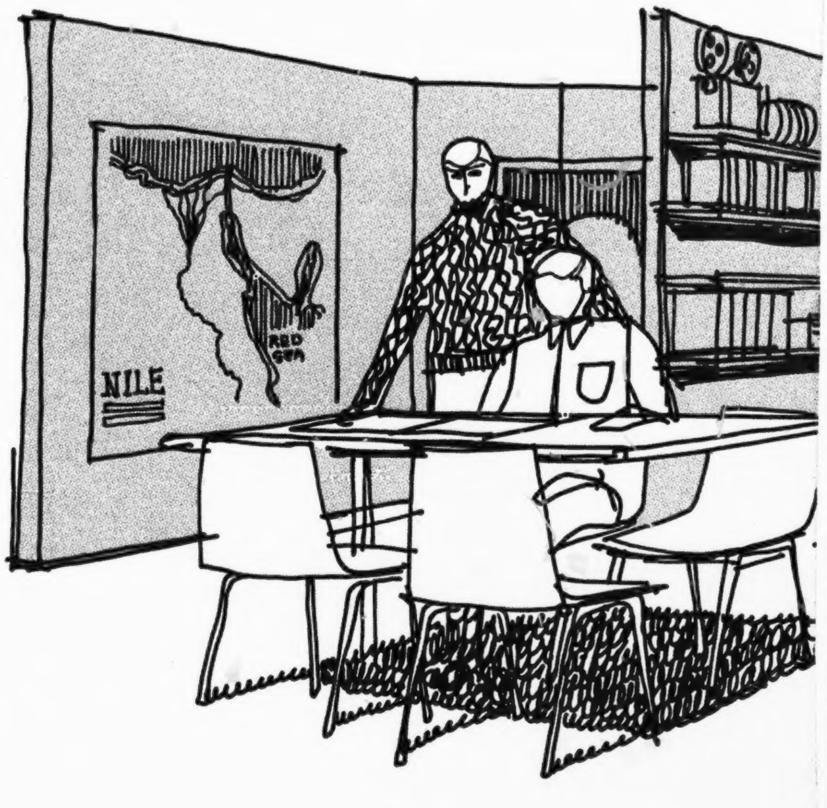
The partitions which define these instructional areas are of several kinds, offering a range of options from relative permanence to instant adaptability. Specifically, there are: 1. Permanent partitions giving physical integrity to each subject-matter suite as a whole; 2. Relocatable partitions to meet changing program needs; 3. Folding operable partitions for transforming spaces on a minute's notice; and finally, 4. Skiddable-screen walls to define a short-term project area and provide visual privacy without permanence.

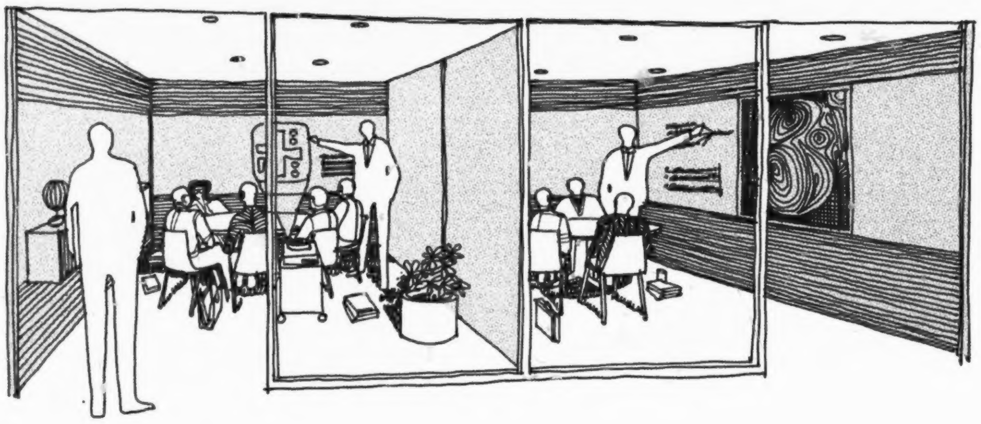

c. teacher planning center
b. seminar area
b
c
d
d. lectures and demonstrations



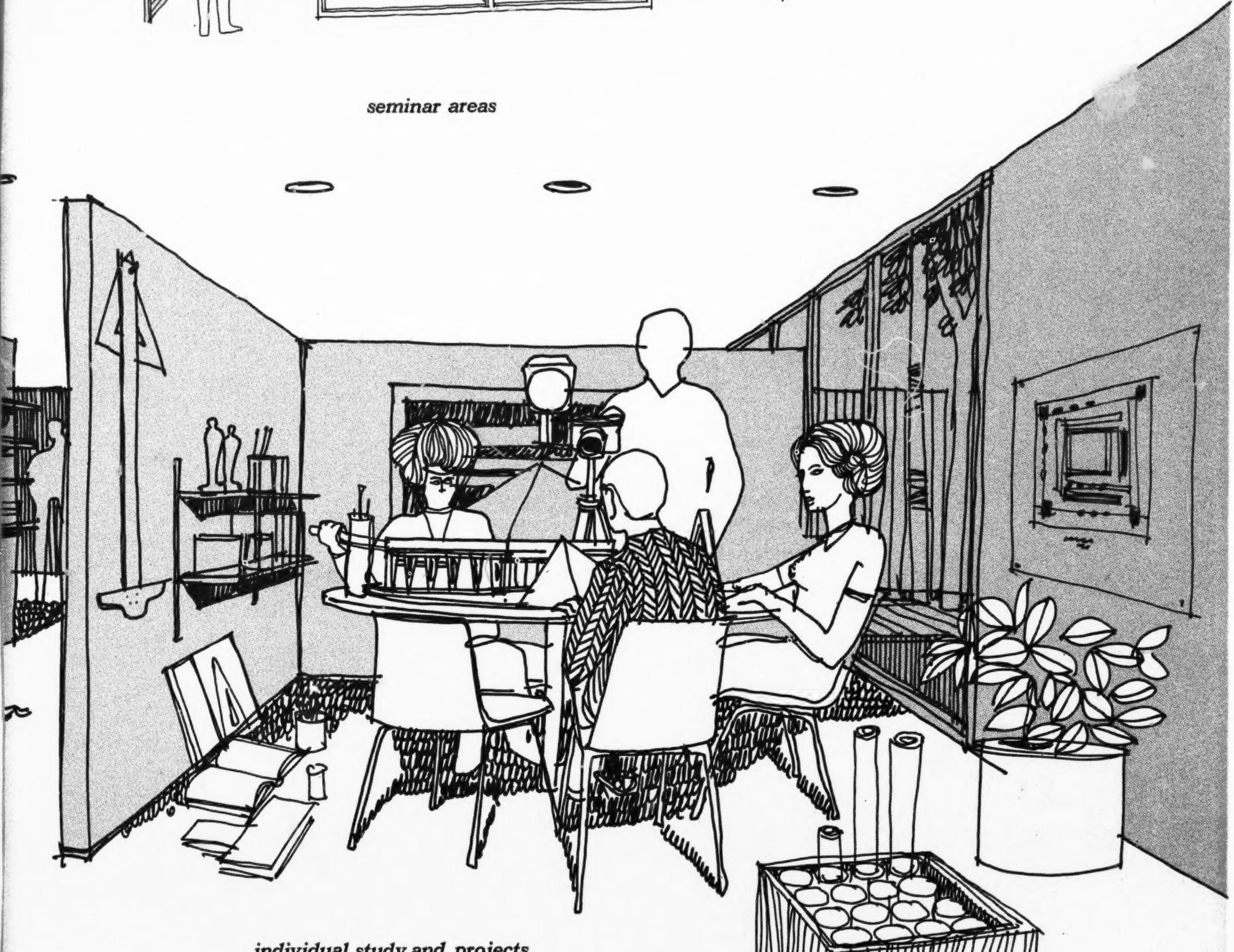
lectures and demonstrations

Subject Matter Suite


NILE
RED SEA



seminar areas



individual study and projects

Science/Math Cluster

For science and mathematics the students from all four houses come to this specialized facility.

As in the middle school, science and math are housed together so that each may support the other and the traditional lines between the scientific disciplines may be crossed. A common planning center for the faculties in the different sciences and mathematics encourages an interdisciplinary approach. Sciences and mathematics share a specialized study area in which displays and resources of common interest are available to students in either or both subjects.

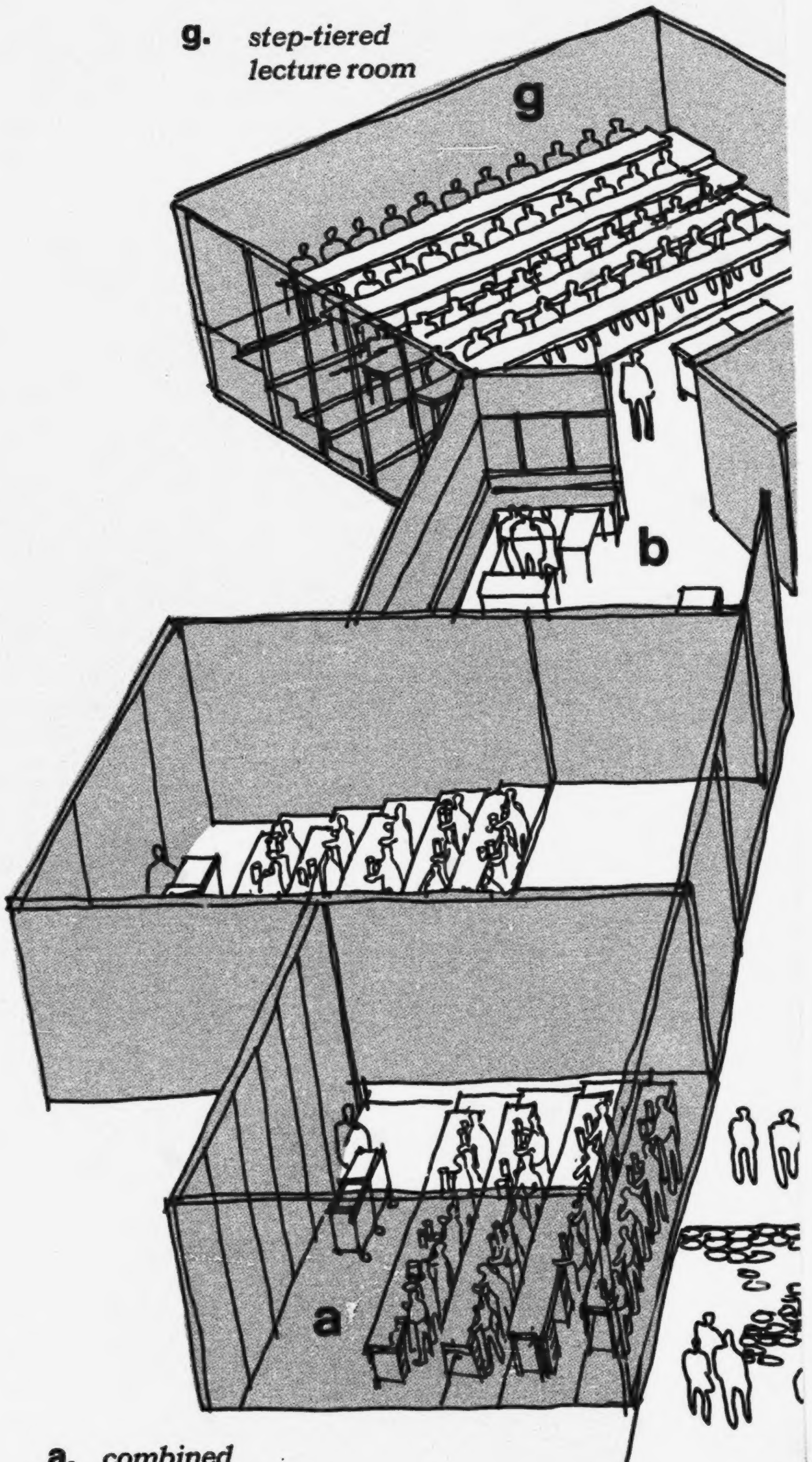
The science-mathematics cluster is designed to share various teaching facilities, rather than to provide discrete spaces for each discipline. In the science-mathematics cluster the space is arranged for the more conventional separation of lecture and laboratory work—an enclosed step-tiered hall for strictly presentation lectures, flanked on both sides by separate laboratory spaces where students conduct experimental work.

Moving counterclockwise, there is a set of *combined* laboratory-lecture spaces in which demonstrations and experiments take place alternately or simultaneously.

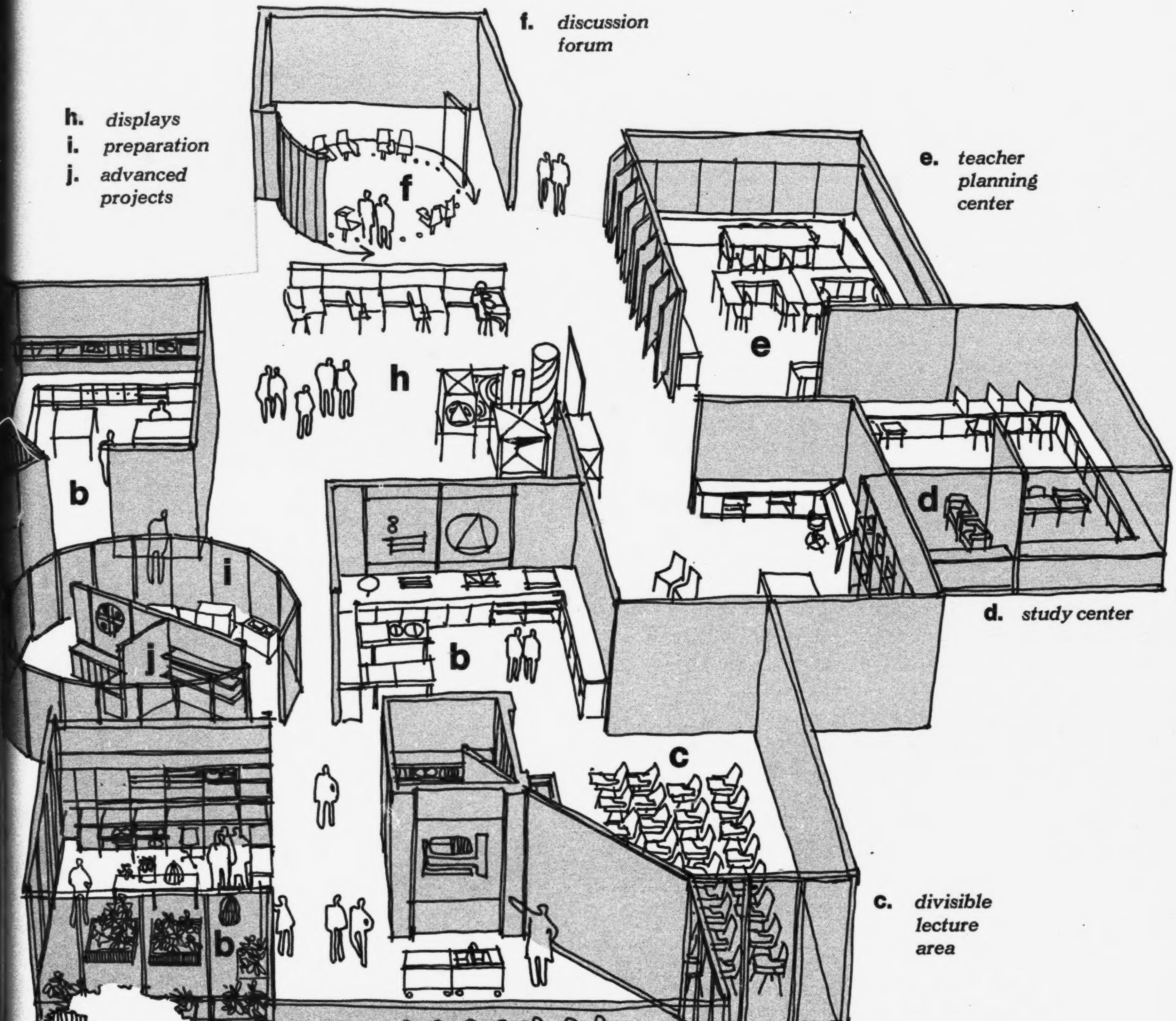
In the next area, the space is arranged to permit students to move easily from either of two laboratories into a small open lecture zone located between them.

The central area is devoted to advanced experimental work over prolonged time periods. The faculty preparation space is located here, too, so that advanced students come into close and frequent contact with the faculty.

g. *step-tiered lecture room*



a. *combined laboratory/lecture rooms*



f. *discussion forum*

h. *displays*
i. *preparation*
j. *advanced projects*

e. *teacher planning center*

d. *study center*

c. *divisible lecture area*

b. *laboratory*

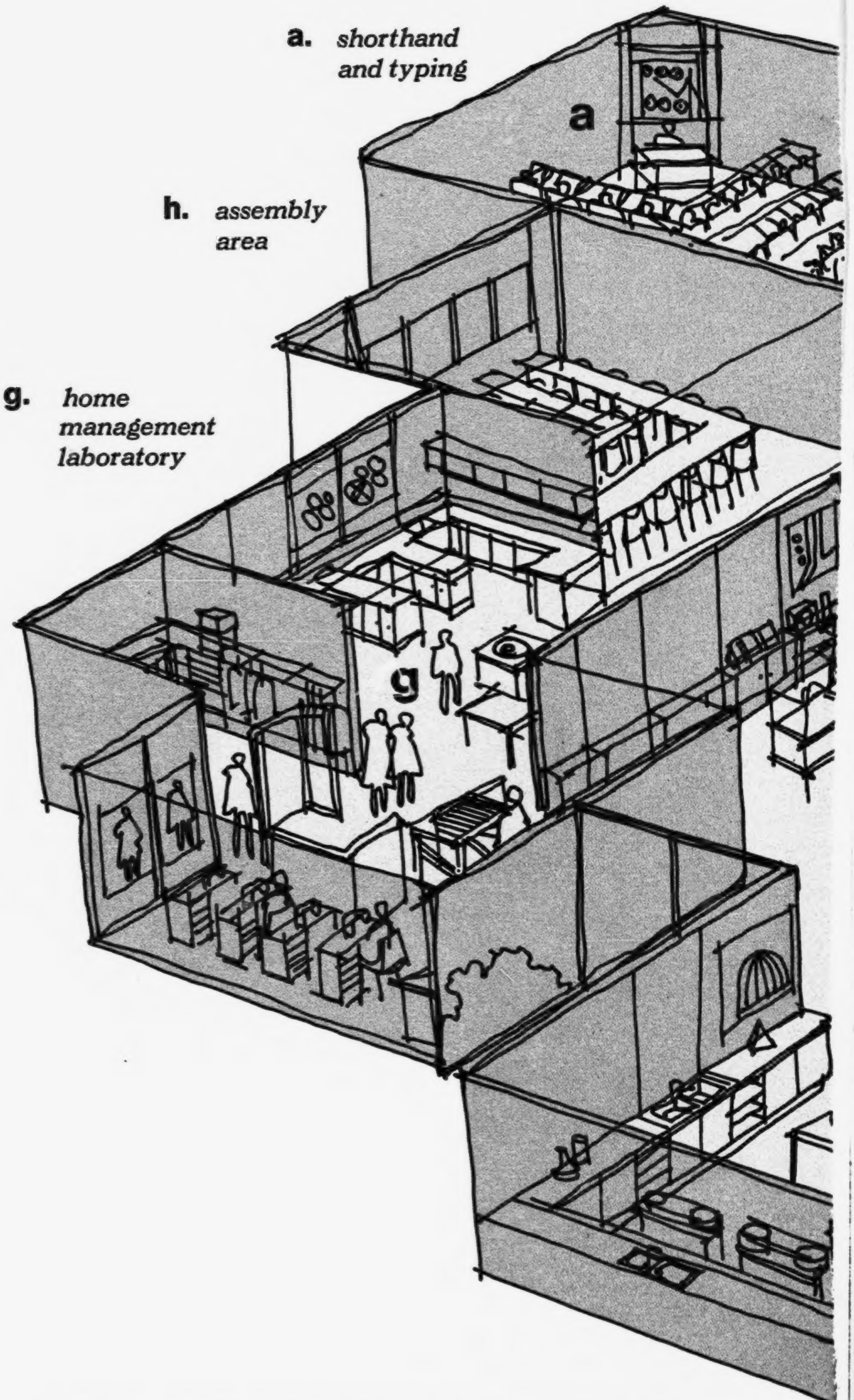
Career Skills Cluster

The career skills department brings together numerous activities which, in most high schools today, are separate and distinct, and it creates for them a congenial environment. These activities center around the production of things that are beautiful or useful or both—tasks which often lose their significance through being broken up into miniscule skills. Here the students would participate in the entire process of creation from the conception and design of an object to its production, distribution, and marketing. This area provides space and equipment for all of the fine and applied arts as well as the arts of homemaking.

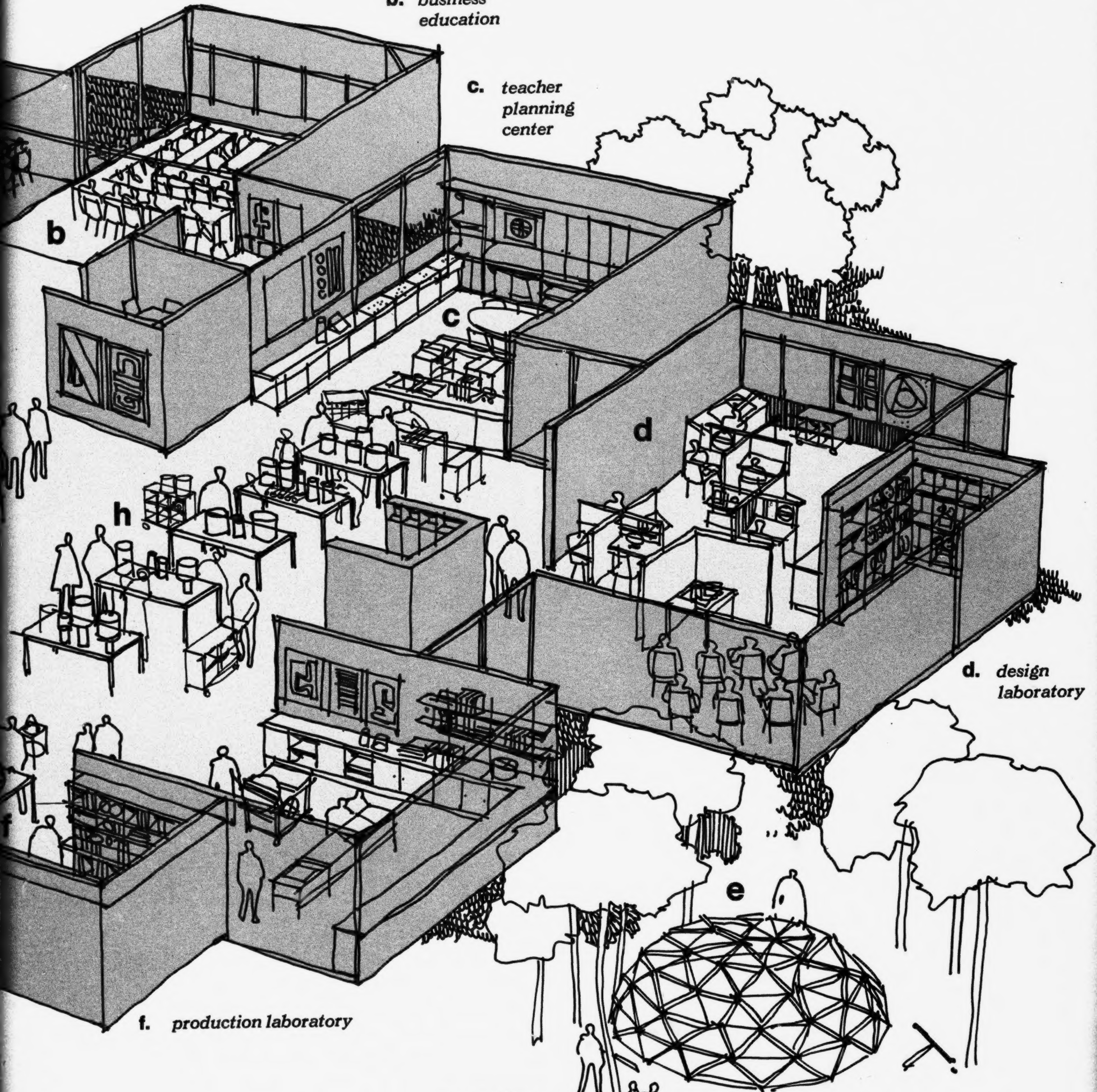
The plan is based on the premise that making useful objects and acquiring the skills and understanding which help to create the human environment are fundamental to everyone's liberal education.

The plan for the career skills department is best read clockwise; beginning in the upper corner are three business-education rooms. Here the students learn how a business is run and managed, how new products are conceived and introduced. A separate room is equipped for teaching the skills of shorthand and typing as useful for students who go on to college as well as those who don't. Together, this whole section serves as a laboratory to prepare students to work in enterprises of all kinds—not only offices, but hospitals, retail stores, and community or government agencies which are employing an ever increasing proportion of our population.

The design laboratory moves the student into the planning of a new product, a work of art, or some special project of his own. All the skills of design—from silk screening to drafting, from advertising layout to using a computer to designing a dress pattern—would be taught here in a flexible, open space adaptable to many purposes. Integrally related is the production laboratory for printing, ceramics, and sculpture. A basic and flexible shop is adjacent to serve them all. A new emphasis is placed on portable hand tools over the traditional floor-mounted tools.


a. *shorthand and typing*
h. *assembly area*
g. *home management laboratory*
a
g

Finally a home management laboratory houses instruction in the art and skills of homemaking—not exclusively for girls, but for boys as well who want to learn to cook, to manage consumer expenditures better, perhaps even to learn a thing or two about the role of the late 20th century husband and father.



b. *business education*

c. *teacher planning center*

d. *design laboratory*

f. *production laboratory*

e. *outdoor construction area*

Afterword

The 4 schools we have suggested in this report were designed not as plans for any particular community, but as a stimulus to open up the options in school design. Too many schools are planned by habit alone. Too many of our schools still stand as handicaps to new programs and new thinking in education. These are not definitive schools but transitional schools for an era in which education is facing new demands and learning to live with new techniques and new tools. They were designed to acknowledge some permanent human values in scale and groupings while at the same time avoiding the dogmatic imperative which says that teaching should be done this way or that forever into the future.

These schools were also designed to avoid the dull, cold, repetitive, institutional quality that characterizes so many of our schools today. For despite the many outstanding schools which are going up across North America, many more are still not so relevant to the new forces in education as they could be.

In sum, this book was published to help school boards and building committees consider the alternatives open to them, to suggest questions as well as answers. For there are more questions than answers in planning schools which will stand into the 21st century as our legacy to education.

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